getting out of trouble's way . . . . .

There is no crossing traffic hazard in Herkimer, N. Y. This section of track, built by the New York Central R. R., eliminates several dangerous grade crossings to safeguard the public.

No matter where tracks are placed, rail joint assembly problems cannot be avoided. Rail joint assemblies must be tight to be safe. You can rely on Reliance Hy-Pressure Hy-Crome Spring Washers to eliminate the hazards of loose rail joint bolts. Reliance Hy-Pressure Hy-Crome Spring Washers are scientifically designed and manufactured from quality steel for long lasting, non-fatiguing service, with reactive pressure that immediately compensates for any bolt looseness. The reactive pressure of Reliance Hy-Pressure Hy-Crome Spring Washers exceeds A.R.E.A. requirements and helps keep your rail joint assemblies out of trouble's way.

WRITE TODAY for six page illustrated folder on Reliance Hy-Crome Spring Washers for track application. See for yourself why Reliance Hy-Crome Spring Washers can prevent track joint trouble for you.

EATON

EATON MANUFACTURING COMPANY

MASSILLON, OHIO

Reliance Division

Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

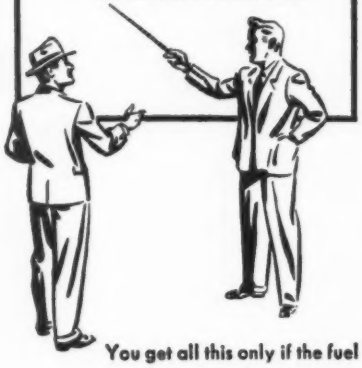
Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago 3, Ill. Subscription price: United States and Possessions, and Canada, $3.00; Foreign $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933 at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., post office. Address communications to 105 W. Adams St., Chicago 3, Ill.

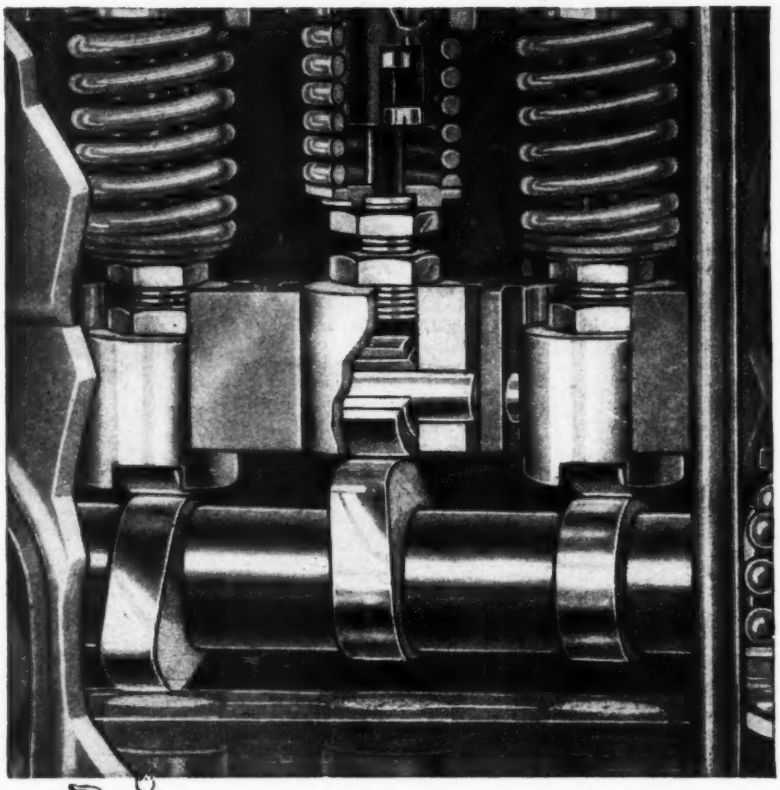
GOOD FUEL INJECTION

Fits the Engine

GOOD FUEL INJECTION PROVIDES:

A. Accurate Metering
B. Precise Timing
C. The Correct Duration
D. A Spray Pattern Tailored to the Combustion Chamber



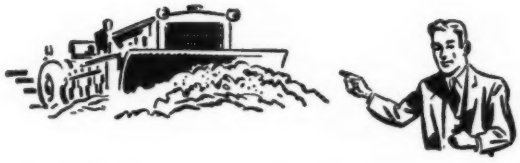


You get all this only if the fuel injection system has been engineered to fit the engine.

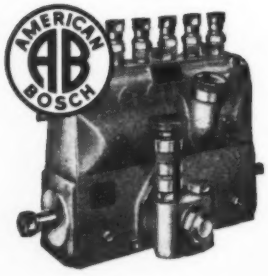
There are types of American Bosch injection equipment to suit all types of engines. The final engineering touches that make the equipment really *fit* involve the specially-designed or selected parts such as cams, plungers, delivery valves and nozzles.

●

THESE CAMS in the fuel pump, for example, are vital. They contribute importantly to control of the rate and duration of injection. They are engineered to co-operate smoothly with other elements of the fuel injection system to produce precisely the type of spray called for by the engine design.



THEY CAN TAKE IT. If your engine has American Bosch injection equipment — the kind that is engineered to fit — you can be sure that it will perform to its very best in giving you economical service under any and all conditions.



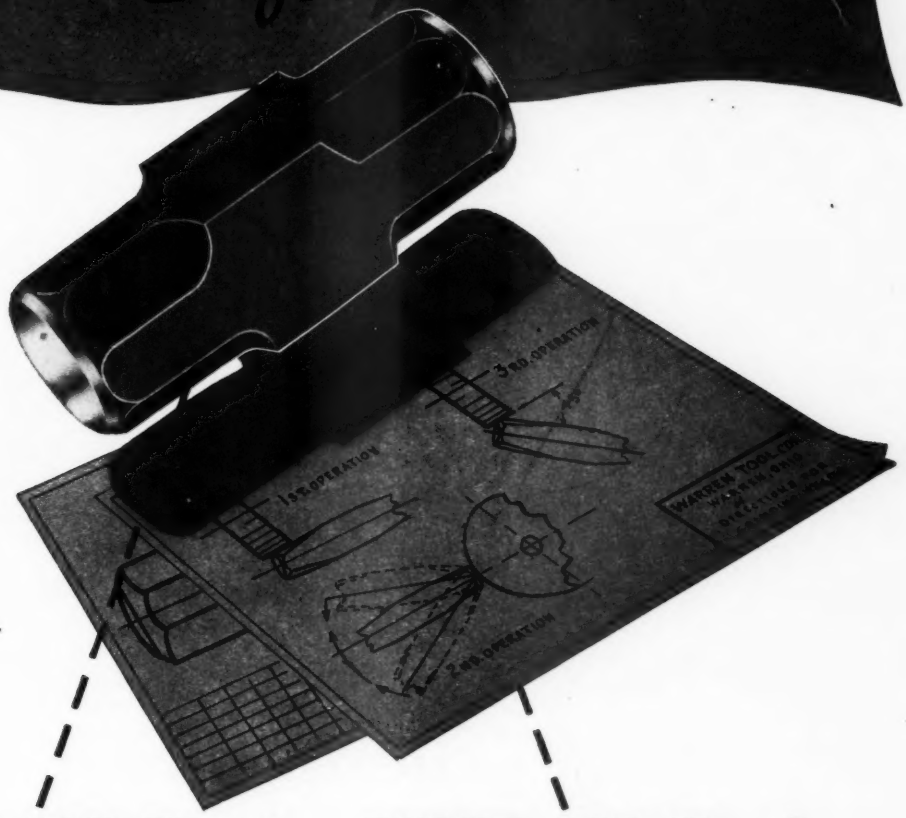
AMERICAN BOSCH CORPORATION, SPRINGFIELD 7, MASS.

AMERICAN BOSCH

Diesel Fuel Injection

Two First Aids

For Safety First



FIRST AID No. 1

Heavy hand tools are the work horses for railroad maintenance. With them America's husky, robust men do the tough jobs along the right of way. Not delicate tools for gentle men —but tough tools for strong men make up the Devil line. Made of selected, electric furnace Tool steel, and made under Warren's production control system, these Devil Tools give safer performance plus longer service. Select them first, for "Safety First."

FIRST AID No. 2

Warren Tool Corporation will furnish you with charts for the care of tools. These charts are Van Dyke prints and you can make as many copies from them as you wish. They make ideal, easy-to-use guides for tool maintenance. Use them too, for "Safety First."

★ ★ ★ ★ ★

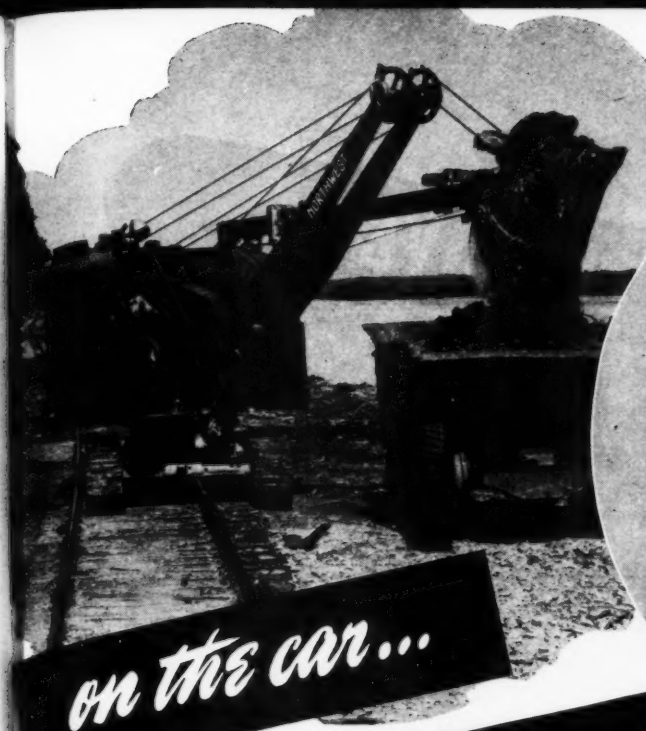
Send us complete details as to where you would like to have us mail the prints.

DEVIL TOOLS

WARREN TOOL CORP. • WARREN, OHIO

GENERAL SALES OFFICES
105 W. Adams St., Chicago

FACTORY: GRISWOLD ST.
WARREN, OHIO



on the car...

off the car...

You can't do this with a

off the track

TRACK CRANE

Your Northwest works from the car, (no rails on the car are required) either as a Crane, Shovel or Dragline. It will load the car ahead, the car behind or the car alongside. It goes from car to car either through drop-end gondolas or standard cars. It is quickly unloaded under its own power and works anywhere on the right-of-way or off the right-of-way—it is the all-round railway man's machine.

The unusual design of Northwest Crawlers, particularly the larger Northwests, with positive traction on both crawlers when turning, as well as when going straight ahead, takes the Northwest where other machines have difficulty. This means a little faster—a little easier clearing of the line when working on the right-of-way—a little more safety!

The "Feather-Touch" Clutch Control provides for easier operation yet assures the feel of the load. The Cushion Clutch reduces overloads on the drum shaft and increases cable life. Uniform Pressure Swing Clutches take the jerks and grabs out of swinging, cut down on wear and tear on the machines and reduce adjustments. Other Northwest features combine to cut down maintenance and speed up output.

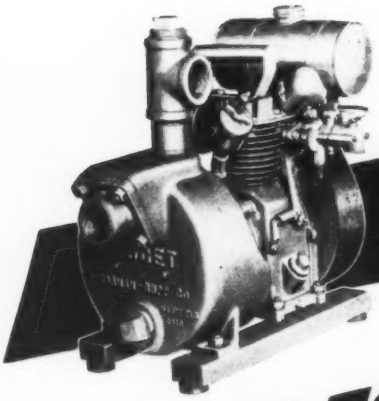
There is a size and capacity for every maintenance of way and storeyard problem.

NORTHWEST ENGINEERING COMPANY
1713 Steger Bldg., 28 E. Jackson Blvd., Chicago 4, Illinois

PROVED on the nation's LEADING RAILROADS

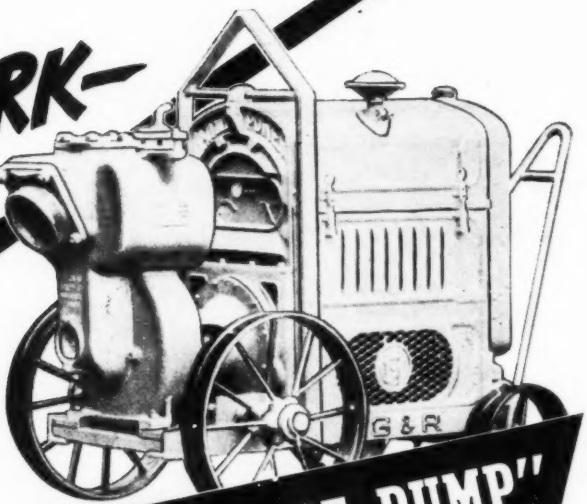
NORTHWEST

THE ALL PURPOSE RAILROAD MACHINE



HANDY TO MOVE—

BRUTES FOR WORK—



EVERY GORMAN-RUPP IS "A LOT OF PUMP"

There's room on the smallest track speeder for a Gorman-Rupp pump that will put out 3,000 gallons per hour against a 20-foot head (The Midget). These can handle many small drainage jobs and get to and from the work quickly. For a little larger job there is the Eagle Model – with a weight of only 124 pounds it will pump 15,000 gallons per hour. This same kind of efficiency runs through the entire Gorman-Rupp line. For your big jobs there are heavy duty models up to 125,000 gallons per hour.

All Gorman-Rupps are completely self-priming. Start the engine and you start the water. They can't be clogged with any muck or solids that will pass the intake strainer. They will run months at a time without shut-down, if necessary. The unique Gorman-Rupp efficiency comes from the kind of streamlining that counts -- internal streamlining that speeds the flow of water.

There's a size of Gorman-Rupp self-priming centrifugal pump to meet the lightest or heaviest railroad needs but, regardless of size, they're all built to railroad requirements of durability.

THE MIDGET -- 3,000 gallons per hour; 20-foot total head, 5-foot suction lift; length, 18½ inches, width, 9¾ inches, height, 15½ inches; weight, 60 pounds.

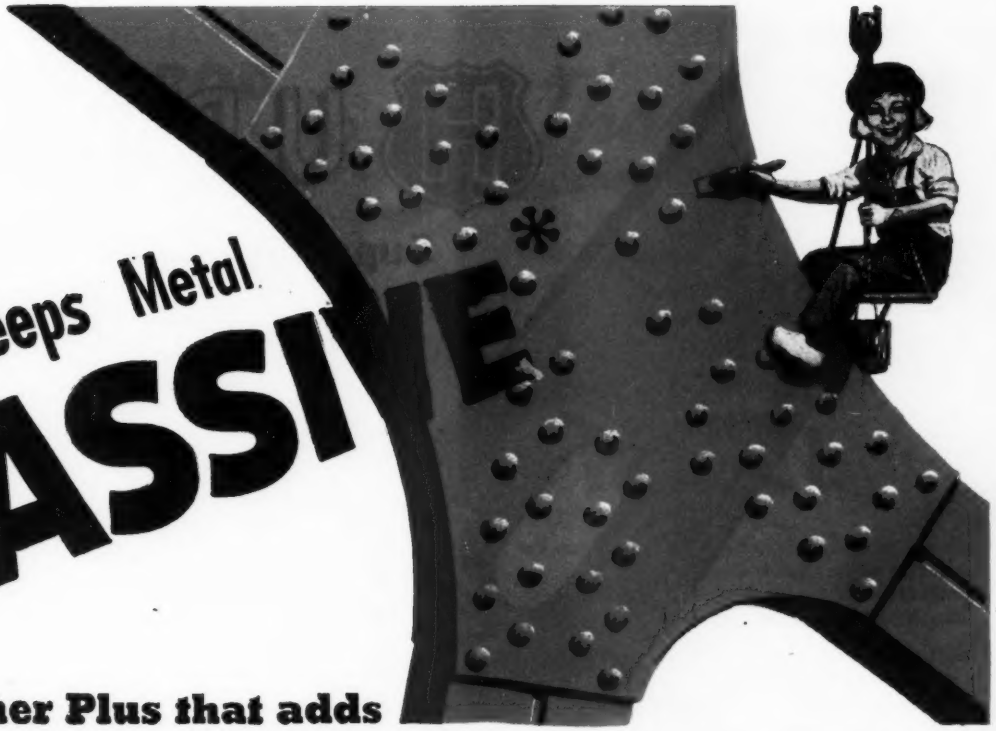
THE EAGLE -- 15,000 gallons per hour (20-foot total head, 5-foot suction lift); length, 31½ inches; width, 20 inches; height, 22 inches; weight, 124 pounds.

MODEL 125-M -- 126,000 gallons per hour (25-foot total head, 10-foot suction lift); length, 72 inches; width, 36 inches; height, 49 inches; weight, 2250 pounds;

GORMAN-RUPP PUMPS — UNSURPASSED FOR PUMPING FAST — ARMY-NAVY "E"

THE GORMAN-RUPP COMPANY

M A N S F I E L D . O H I O



Keeps Metal PASSIVE*

...another Plus that adds to RED LEAD'S Extra Rust Protection...

There is no question about Red Lead's acceptance throughout industry as the standard priming paint for *making metal LAST*.

One important reason is its ability to keep metal surfaces in a "passive" or rust-inhibiting state. Authorities agree that metal protective paint should be rust-inhibitive to give satisfactory performance.

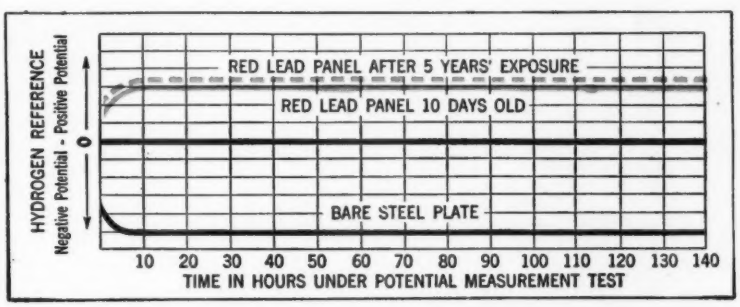
Time-potential curves, such as the one at right, are used to express rust-inhibitive properties of paint and thus indicate its effectiveness of protection. They show the effect of Red Lead on the potential of steel in the presence of moisture or water.

For example, a steel panel whose potential is *positive*, relative to hydrogen, is considered to be in a passive or non-corroding state. A negative potential indicates corrosion activity or rusting. The graph shows clearly the rust-inhibitive effect of Red Lead paint on steel as contrasted with the rapid and continuous rusting of unpainted steel.

Note that in this test a Red Lead paint film which had weathered 5 years was just as effective in preventing rust as one which had dried for only 10 days.

Specify RED LEAD for All Metal Protective Paints

The value of Red Lead as a rust preventive is most fully realized in a paint where it is the only pigment used. However, its rust-resistant properties are so pronounced that it also improves any multiple pigment paint. No matter what price you pay, you'll get a better metal paint if it contains Red Lead.



*Proof That Red Lead Keeps Metal Passive

In the above test a piece of unpainted steel was immersed in water. Iron, going into solution, reacted with oxygen in the water to form rust. This unrestrained corroding state is indicated by a rapidly developed and maintained negative potential (see above graph). However, when steel panels painted with Red Lead were immersed under the same conditions, ferric and lead salts formed directly next to the metal. This action at once stifled corrosion by preventing the iron from going into solution, thus keeping the steel surface passive. The result is shown in the graph curves above, where a quickly rising positive potential remains constant throughout the test.

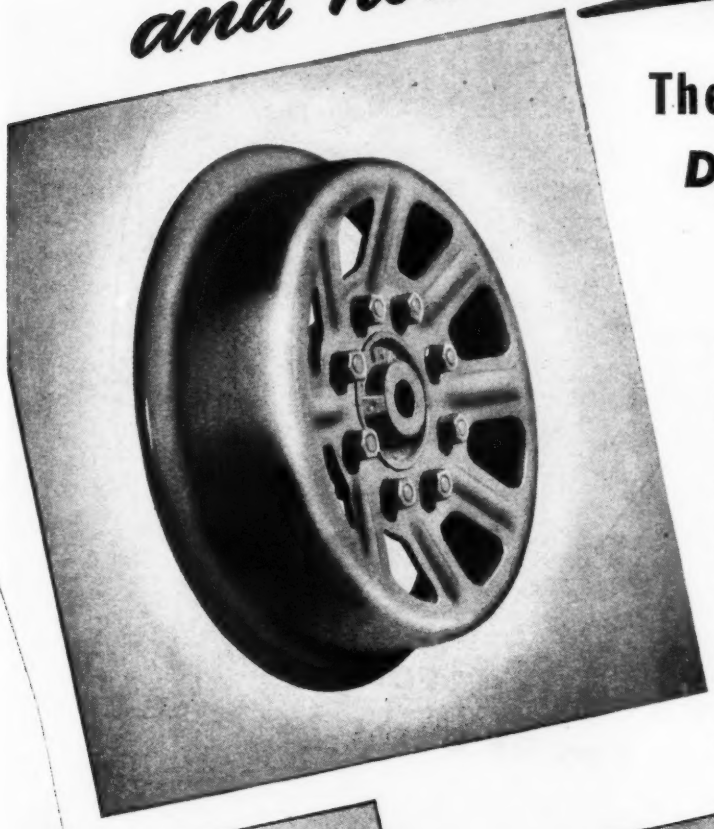
Write for New Booklet—"*Red Lead in Corrosion Resistant Paints*" is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior protection. It also includes typical specification formulas ... ranging from Red Lead–Linseed Oil paints to Red Lead–Mixed Pigment–Varnish types. If you haven't received your copy, address nearest branch listed at right.

All types of metal-protective paints are constantly being tested under all conditions at National Lead's r ny proving grounds. The benefit of our extensive experience with Red Lead paints for both underwater and atmospheric use is available through our technical staff.

NATIONAL LEAD COMPANY: New York 6, Buffalo 3, Chicago 80, Cincinnati 3, Cleveland 13, St. Louis 1, San Francisco 10, Boston 6 (National-Boston Lead Co.); Pittsburgh 30 (National Lead & Oil Co. of Penna.); Philadelphia 7 (John T. Lewis & Bros. Co.); Charleston 25, W. Va. (Evans Lead Division).

DUTCH BOY RED LEAD

ALWAYS GOOD... *and Now Better Than Ever!*



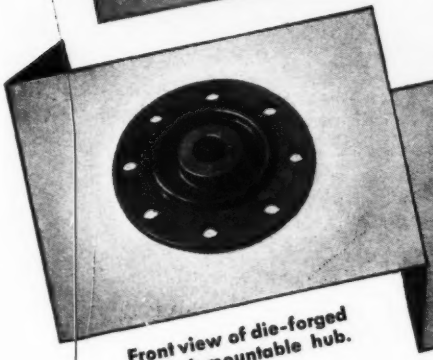
The FAIRBANKS-MORSE *Demountable-Hub* WHEEL

● Extra thickness and extra hardness at the areas of greatest wear—those are the exclusive new advantages of Fairbanks-Morse Sheffield-Steel Wheels for motor, trailer, and push cars.

These life-prolonging qualities result from cold-pressing with newly-designed dies on a 1500-ton press. Fairbanks-Morse controls every processing operation in the manufacture of these wheels. This assures absolute uniformity of the finished product.

The improved wheels conform to all A.R.E.A. standards. Absolutely concentric, they are available in insulated or uninsulated types, in 14-, 16-, and 20-inch sizes.

Write for bulletin. Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.



Front view of die-forged steel demountable hub.

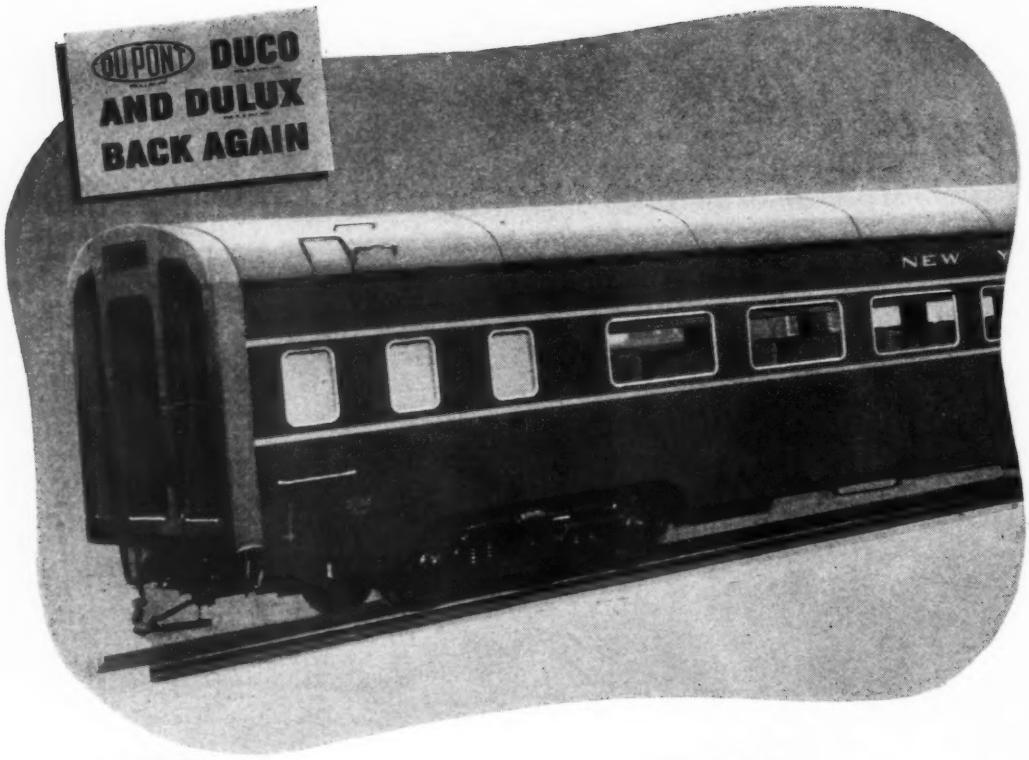
Demountable wheel plate without demountable hub. Note sturdy construction.

Fairbanks-Morse Motor Cars—"first on the rails and still first."

Fairbanks-Morse

A name worth remembering

Diesel Locomotives • Diesel Engines
Scales • Motors • Pumps • Generators
Magnetos • Stokers • Railroad Motor Cars and Standpipes • Farm Equipment



IT'S "OKAY COACH" FOR THOUSANDS OF GRINDING MILES

EXCESSIVE SHOPPING CUTS REVENUE. That's why so many railroads have made Du Pont DULUX their first choice as a protective finish. DULUX is tough and adhesive, resistant to severe weathering and the abrasive action of dust and cinders. In a number of instances, cars finished in DULUX have stayed in service for ten years without time-out for refinishing. If you're not using this outstanding finish on locomotives, passenger and freight cars, and stationary equipment—put it to the test without delay. DULUX will give you better service at lower cost per mile.

E. I. du Pont de Nemours & Co. (Inc.), Finishes Div., Wilmington 98, Del.

DEPEND ON DU PONT FOR BETTER FINISHES

REG. U.S. PAT. OFF.

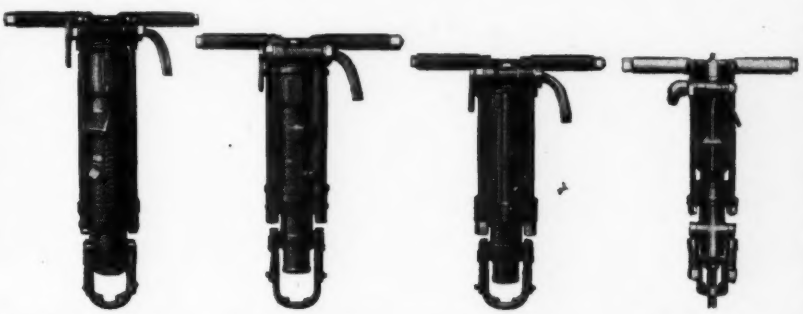
BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Cleveland Sinkers

PACK A MIGHTY WALLOP

Cleveland Sinkers are ea[sy] ... consumption. Many sizes, in wet or dry co... ...g in every type of rock. Available with chucks for collar... ...steel, and plain or lugged shanks. Drop forged construction insure... super strength. End-seating valve (used on most models) improves with us... prevents greater air consumption as drill grows older. • Mountings availabl... for Models H111 and H10 for conversion to drifter type drills, used on colum... arm or tripod. • Be sure to use these sinkers with the Cleveland Accessori... shown here. *Remember, the most efficient rock drill delivers even bett... performance when equipped with the proper, high-quality accessorie...*

Write for Bulletin 122 on Sinkers—Bulletin AC-11 on Accessories



Model H23, 83 lbs. For extra tough drilling.

Model H111, 55 lbs. An all around favorite.

Model H10. Leader in the 45 lb. class.

Model H66, 32 lbs. Light but powerful.

FOR BEST RESULTS USE

CLEVELAND ACCESSORIES

"Veribest" Air Hose is extra tough, withstands rough treatment.

Cleveland Air Filters prevent fine trash from entering your drill.

Cleveland Line Oiler keeps drills amply lubricated and working at top speed.

Hose Clamp Tool is handy and efficient for securing wire clamps to hose and fittings.

Type "A" Couplings a... made of a tough, rust-proo... bronze alloy. Quick-actin...

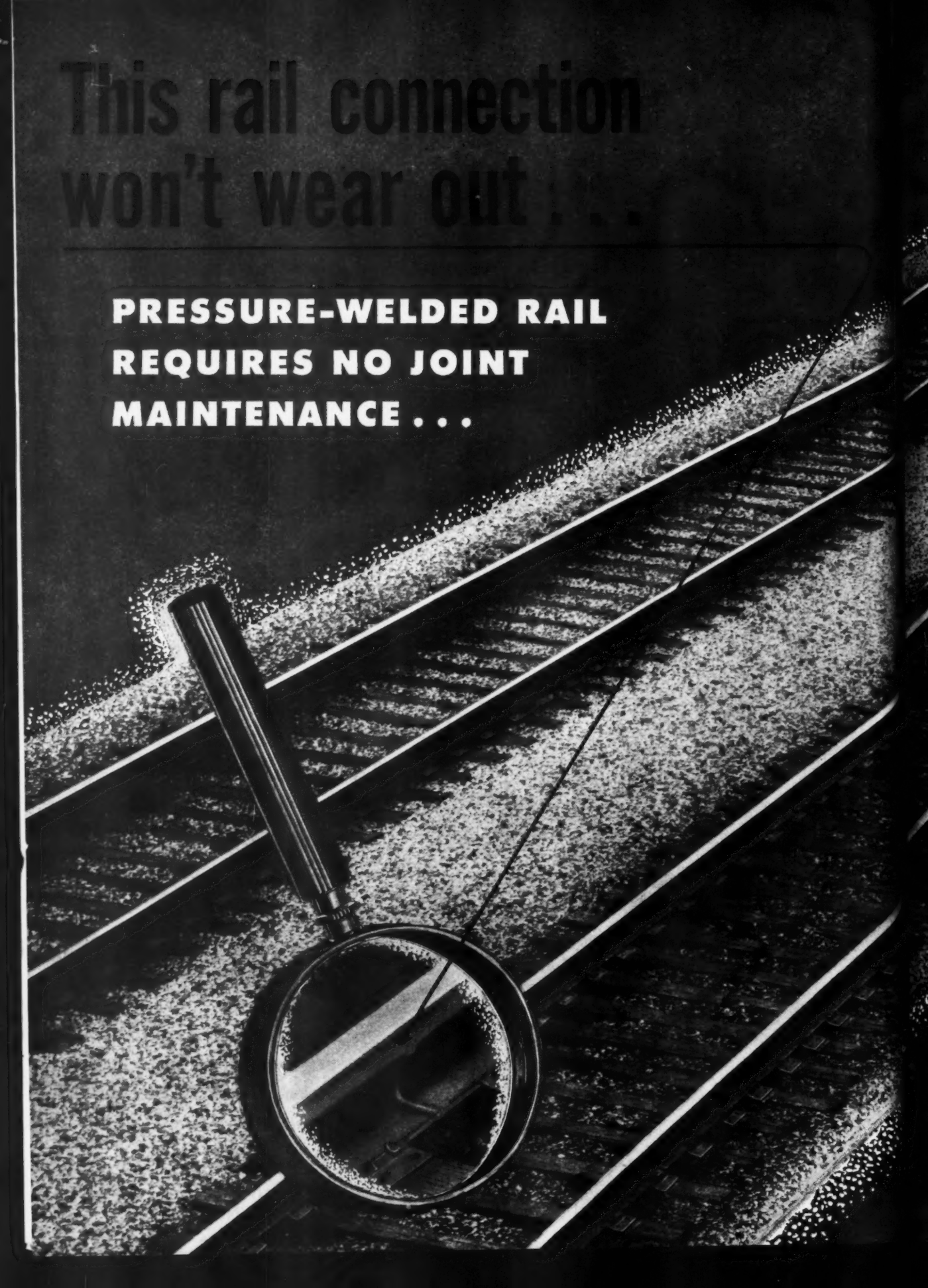
LEADERS IN DRILLING EQUIPMENT

CLEVELAND ROCK DRILL DIVISION
THE CLEVELAND PNEUMATIC TOOL CO.
CABLE ADDRESS: "ROCKDRILL"
CLEVELAND 5, OHIO

Address all inquiries to
RAILWAY DIVISION
50 Church St.
New York 7, N. Y.
Telephone Rector 2-2572

This rail connection won't wear out . . .

PRESSURE-WELDED RAIL REQUIRES NO JOINT MAINTENANCE . . .



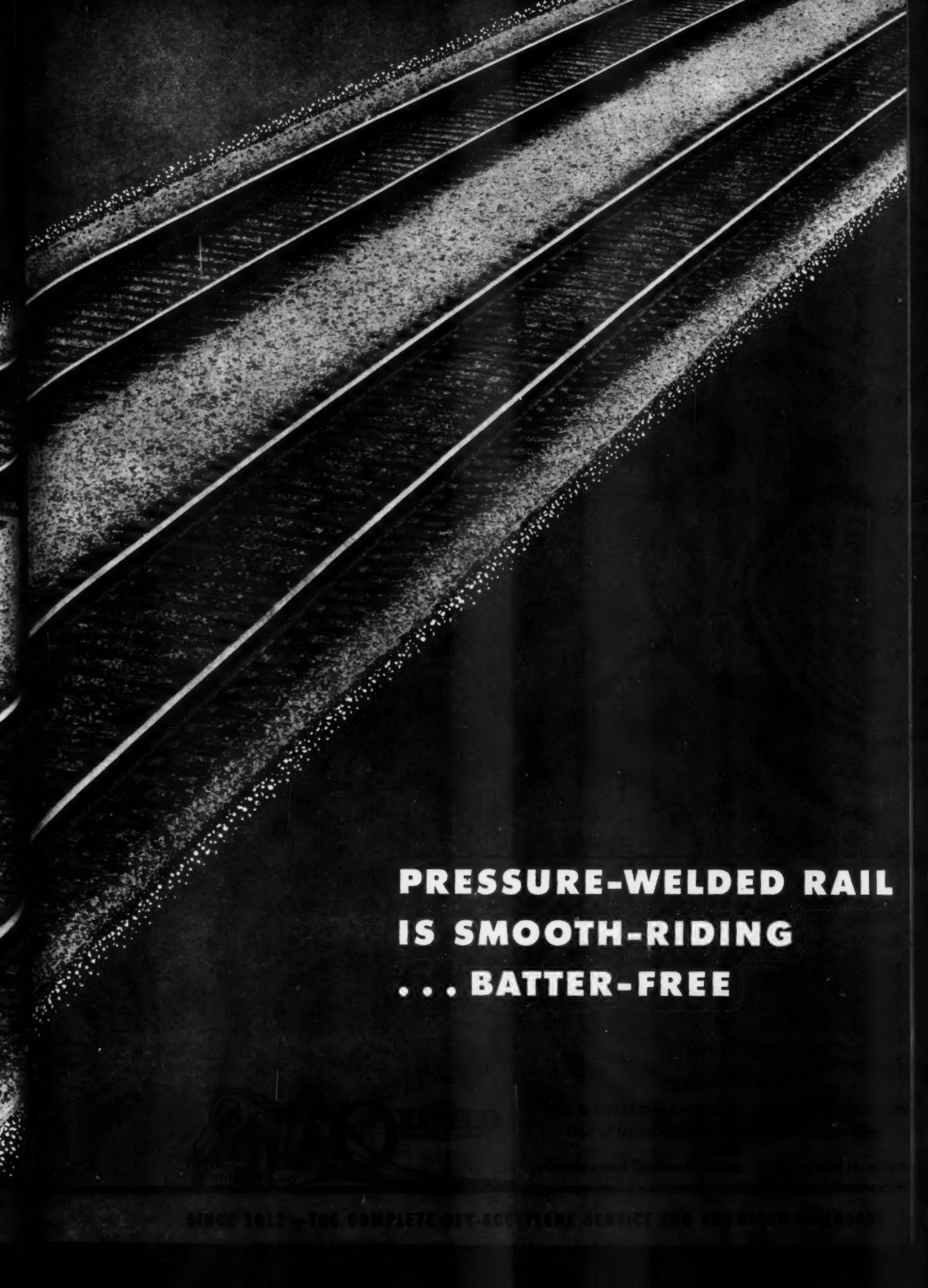

PRESSURE-WELDED RAIL
IS SMOOTH-RIDING
. . . BATTER-FREE

Illustration taken from the booklet "Observations on the Jackson Line" — darned interesting to every maintenance man. Write for free copy.

THIS WAY THE HULA HULA WORKS FOR YOU!

and BETTER, FASTER TIE TAMPING IS A MATTER of MULTIPLE MOVEMENT TOO!

JACKSON UNIVERSAL Tampers

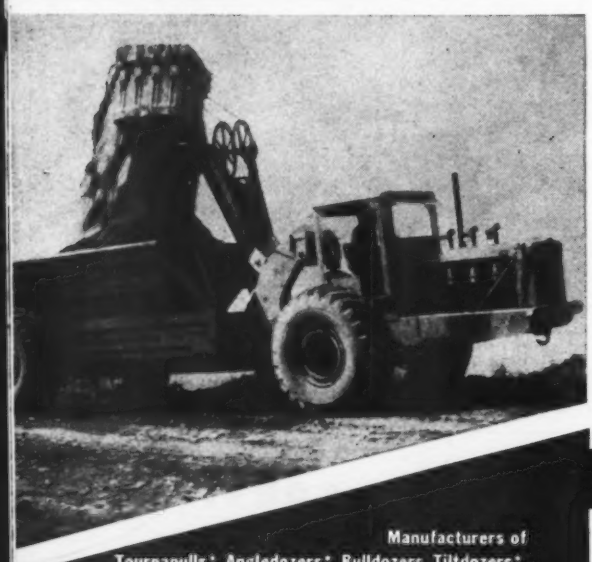
WITH action that would make any hula girl think she was tied to her chair, JACKSON Vibratory Tampers do a job of ballast placement, in any ballast and any lift, that simply isn't equaled either in quantity or quality. Furthermore, they conserve labor, the weight of the machine and the vibratory action do the work — little more than guidance is required on the part of the operator.

If you want the key to one of the toughest railroading problems of today, how to get more and better track maintenance — write for the complete details on JACKSON Tampers and Power Plants and how to use them. It's a significant fact that this equipment is standard with 4 out of 5 of the leading roads. Write, NOW!

ELECTRIC TAMPER & EQUIPMENT CO., Ludington, Michigan

Off-Track

USED TO SOLVE PROBLEMS FOR



CB&Q For fast, low-cost handling of a 9-mile major Burlington maintenance project between Chariton and Lucas, Iowa, Marsch-Peterson Co. of Chicago and Omaha used 7 off-track, rubber-tired Tournapulls. These versatile units handled earthmoving to protect and widen banks and slopes, also dug and cleaned out drainage ditches. Operating in saturated gumbo over heavy blue clay, the Tournapulls moved over 900,000 yards of dirt . . . hauled it about one-half mile along the road-bed, crossed main-line track, and wasted it over opposite embankment . . . all without any interruption to rail traffic.

CRI&P Elimination of steep grades and bad curves required relocation of approximately 23 miles of the Rock Island main line, between Perlee and Eldon, Iowa. Peter Kiewit Sons Co. of Omaha used 6 Tournapulls to help move the 2,300,000 yards of earth involved. New route shortens track 3 miles; new road-bed permits laying heavier rails. Note how Tournapull loading keeps cuts smooth even in this tough Iowa gumbo. Fast-moving Tournapulls load, haul and spread in one operation . . . no big, expensive loading unit or special spreading tools needed. They save equipment investment, require fewer men.

CMStP&P A big, new, level-grade yard for the Chicago, Milwaukee & St. Paul between Mannheim and Bensenville, Ill., required removing a 600,000-yard switching hump. Contractors Raemisch-Madden & McQueen had a 60-day time limit, completed job in 48 despite 18 days rain in first 30! 12 big-tired Tournapull prime movers, powering ten 15-yard Carryall Scrapers and two 17-yard Tournatrailers were used in removing the soft and extremely muddy old fill. A dump with 40,000 yards of junk and refuse was cleared in 10 days because big-tired Tournatrailers gave ample flotation to stay on top of the muck. Superintendent said: "Tournapulls were often forced to work under seemingly impossible conditions . . . came through with flying colors".

Manufacturers of
Tournapulls®, Angledozers®, Bulldozers, Tiltdozers®,
Carryall® Scrapers, Power Control Units, Rooters®,
Tournatrailers®, Tournacranes®, Tournatrucks®.

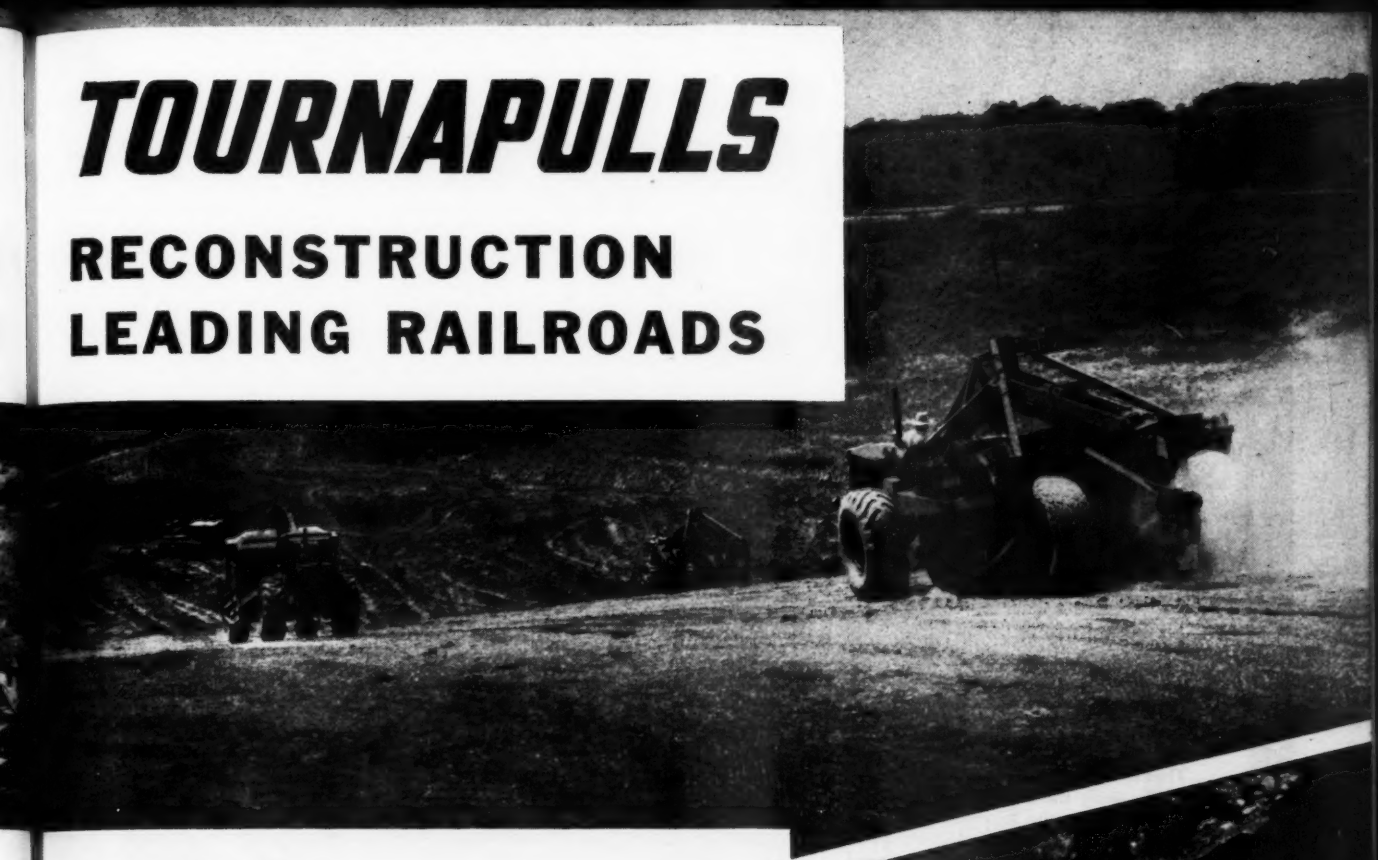
LE TOURNEAU

PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

JOB-PROVED
Over 4000 Built and Shipped

TOURNAPULLS

RECONSTRUCTION LEADING RAILROADS



AT&SF To reduce curves from 4 to 1° and increase train speeds from a maximum 50 to 105 mph on double-track mainline between Elmer and Cardy, Mo., the Santa Fe contracted with Cameron-Joyce and O'Dell-Riney to move 800 to 900,000 cubic yards. One fill alone called for 250,000 yards to maintain 0.8% grade. Here, 7 Tournapulls work a 975' one-way haul over 10% grade from cut to fill. Despite steep grade, sticky clay and shale, each Tournapull averages 11 trips load-haul-spread-and-return per hour.

MP On new double track Missouri-Pacific main line between St. Louis, Denver and Omaha, Samuel Kraus Co. of St. Louis used 4 Tournapulls to strip a 400,000 cu. yd. rock cut, then shifted prime movers from Carryalls to Tournatrailers for shovel loading. These fast job-proved units hauled 8 loads of rock per hour on 3000' cycle . . . end-dumped heaped loads on fill, which LeTourneau Dozers kept in shape. One-man Tournapulls with interchangeable Scrapers, Trailers and Cranes make big savings on railroad jobs.

NR of M Constructores Mexicanos S.A. is using 4 Tournapulls to supply gravel for ballasting a section of National Railways of Mexico, near Ixtepec, Oaxaca, Mexico. The Tournapulls load gravel in the Ixtepec River. On 5'6" x 24" rubber tires, these high-speed self-powered Scrapers have ample traction and power to haul unassisted through the river and pull up a 12% grade from the river bed. They travel 4,000 feet to a railroad siding where they stockpile their loads.

Tournapulls profitably handle railroad reconstruction and maintenance problems because: (1) off-track operation gives you fulltime production; (2) you get quick moves anytime, don't tie up track or train equipment; (3) two-wheel prime mover gives ample traction on steep grades and soft fills; (4) positive ejection cleans bowl of sticky materials, and (5) less weight per h. p. gives quick acceleration for high average speed.

RRS

TOURNAPULLS

Ask for a LeTourneau Field Engineer to study and make recommendations on your maintenance dirtmoving problems

Packs the EXTRA WALLOP

that Drives Cut-Spikes FASTER!

A TOOL OF MANY USES

A quick, simple change in the front head will adapt your Thor No. 25 Spike Driver for breaking concrete and ice, cutting asphalt, digging clay and shale, and many other jobs.

Thor

PNEUMATIC

SPIKE DRIVER

Maintenance Gang foremen know that they lay more track when their crews are equipped with powerful, easy-handling Thor Pneumatic Spike Drivers. They've seen the results that Thor's extra-long, shorter-travel piston brings through harder blows. A block type, with a "business end" at both ends, the Thor piston is reversible for double life . . . and lower maintenance cost. It is in perfect balance with the cylinder and the Thor automatic valve to provide smooth operation that assures easy handling. Also, because of the shorter travel of both piston and valve, the Thor Spike Driver gets *more work* from all the air—a vital factor where portable compressors are used.

Both light and heavy duty models are available in the Thor line. See your nearby Thor contractors' tool dealer for full details and a free demonstration.

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. Jackson Boulevard, Chicago 6, Illinois

Birmingham Boston Buffalo Cleveland Detroit Los Angeles Milwaukee New York Philadelphia Pittsburgh St. Louis Salt Lake City San Francisco Toronto, Canada London, England

Thor **PORTABLE POWER TOOLS**

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

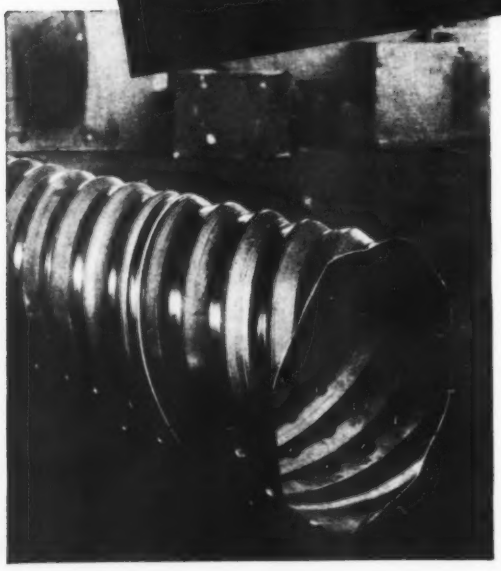
Get rid of COSTLY WATER POCKETS THIS EASY, SURE WAY

Standard ARMCO Perforated Corrugated Pipe was used to drain water pockets in the subgrade along this Midwestern railroad. Bottom view shows a section of helically corrugated (Hel-Cor) Perforated Pipe also used for subdrainage.

When water pockets in your roadbeds cut deeply into maintenance budgets, it's wise to put ARMCO Perforated Pipe on the job.

The use of this sturdy perforated pipe for drainage of pockets assures a stabilized subgrade and permits normal maintenance of the track.

Naturally your best insurance is to install this durable galvanized pipe when the roadbed is constructed. But if water pockets have formed in your present roadbeds, proper use of ARMCO Perforated Pipe will give you quick, efficient drainage.



CARRIES HEAVY LOADS, HIGH SPEEDS

The flexible, corrugated metal design and strong joints resist crushing and disjointing. Heavy loads, high speeds, and severe frost heaving will not affect the system.

An Armco engineer will gladly give you complete information about ARMCO Perforated Pipe. Write your nearest Armco Drainage & Metal Products, Inc., Office or the executive offices of the company, 2911 Curtis Street, Middletown, Ohio.

ARMCO

ARMCO DRAINAGE & METAL PRODUCTS, INC.

Forming rear wheel discs on a 450-ton press in the Oliver "Cletrac" plant.

This is a pressing matter!

In this huge 450-ton press, many heavy precision parts are formed for Oliver "Cletrac" crawler tractors. Like clockwork, a part is formed every few seconds . . . another example of the modern production methods and equipment that permit Oliver "Cletrac" to build in added quality at no extra cost to the user.

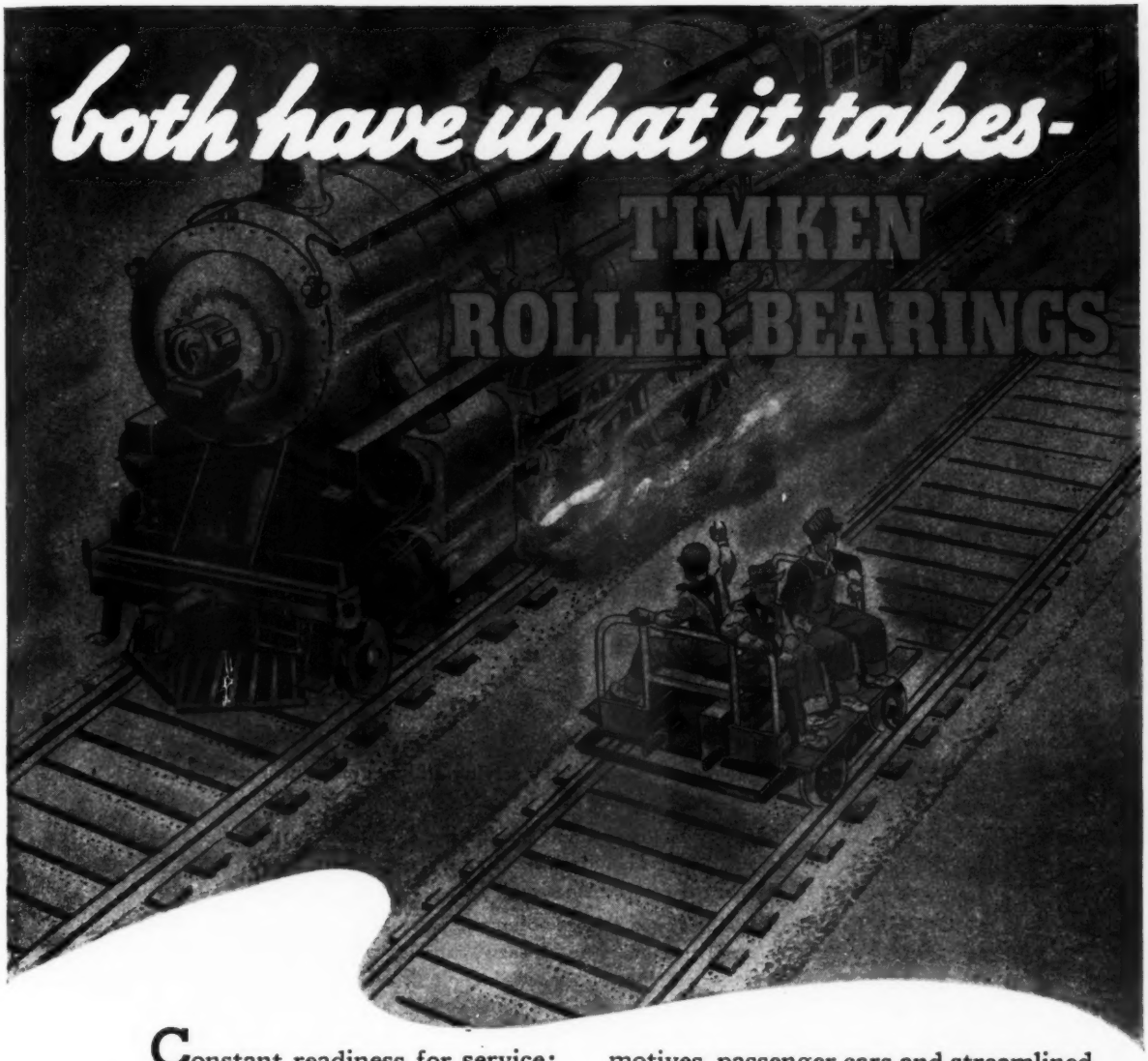
Quality is the keynote that characterizes every Oliver "Cletrac" crawler tractor . . . in design, workmanship, materials and performance . . . quality that means years of dependable, economical service.

Maintenance of this standard enables your Oliver "Cletrac" dealer to offer you the finest in crawler tractors . . . for your every need.

CLETRAC

a product of **The OLIVER Corporation**

THE OLIVER CORPORATION Cletrac



Constant readiness for service; ability to stay on the job for maximum periods without shopping; minimum attention for lubrication and maintenance; all these advantages are common to equipment using Timken Bearings —main line or auxiliary.

Your road probably has them in locomotives, passenger cars and streamlined trains; you should have them in your new section motor cars and trailers; you'll find them in leading makes. Ask this question before buying: "Are they Timken Bearing Equipped"? And make sure the trade-mark "TIMKEN" is stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
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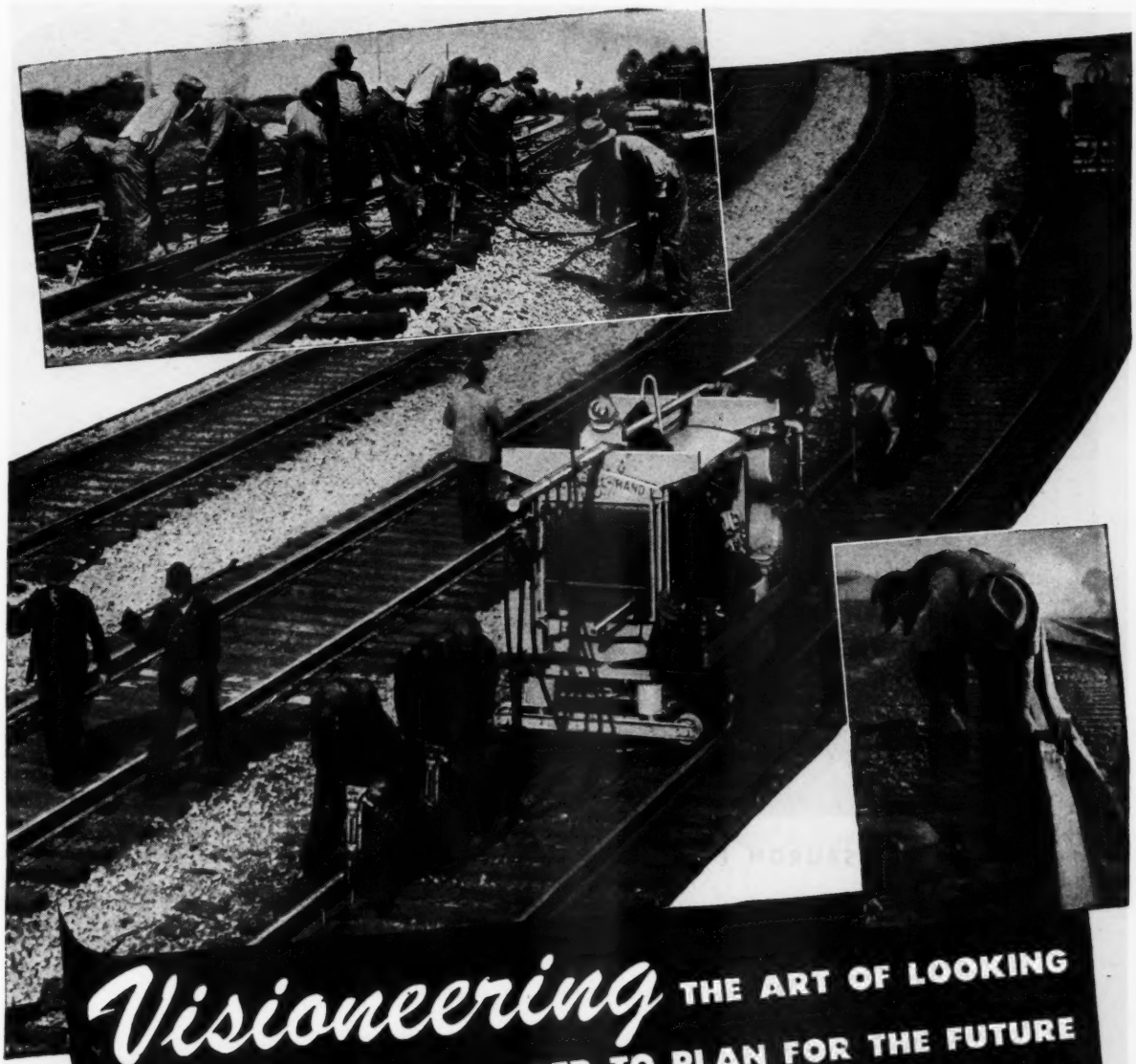
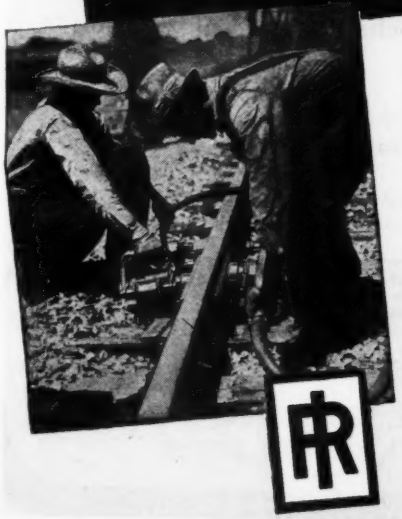
TAPERED ROLLER BEARINGS



Visioneering THE ART OF LOOKING AHEAD IN ORDER TO PLAN FOR THE FUTURE



Engineering and Maintenance did a remarkable job of keeping war-time traffic on the move. For three consecutive years the maintenance forces were hard pressed for labor. The solution was—more power tools—they helped to maintain track—safe track—that carried the extra-heavy traffic that helped in the hard-won victory.

Railroad "Visioneering" includes the use of the many I-R Track tools which lessen operator fatigue—offset rising costs—increase productiveness of labor and equipment. These tools include lightweight tie tampers, speedy spike drivers, powerful wrenches, wood borers, rail drills, grinders, etc.—a complete line of *air* tools which assure savings in every operation—and a complete line of I-R compressors to furnish the air power.

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A PITTSBURGH PIPE SEWER CLEANING SUCCESS ON THE L & N

Our expert engineers have the specialized tools, the experience and the knowledge to clean pipes and sewers thoroughly. Just one example of the rèsults we have obtained is pictured above. Here you see the rocks, dirt, railroad tie and other debris that were successfully removed from 225′ of 24″ concrete sewer at the Louisville & Nashville's Decoursey Yards. Our experts can achieve the same results for your railroad! Just write us about your pipe cleaning problems today.

Mechanical and Hydraulic Pipe Cleaning

We will be glad to send you information about our complete contract pipe cleaning service.

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PITTSBURGH, PHILADELPHIA, BALTIMORE, WASHINGTON.
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CORRUGATED TRANSITE *for interiors too!*

Corrugated Transite is durable... needs no maintenance. *And it's low in cost!*

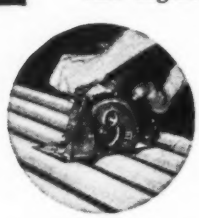
LONG USED on the exterior of railroad buildings as a fireproof, rotproof, rustproof sheet material for walls and roofs, Johns-Manville Asbestos Corrugated Transite offers a way to save money on *interior* construction and maintenance as well, as shown in the locker room photograph above.

Quickly and economically installed, with a minimum of framing, it requires little or no upkeep . . . is highly resistant to smoke and engine-house fumes. Made of asbestos and cement, practically indestructible materials, it can't rot . . . can't rust . . . can't burn . . . requires no painting.

Corrugated Transite is eminently suitable for use in engine houses, shops, freight terminals, storehouses . . . and in public places where attractive appearance as well as rugged durability are important factors.

For more facts, send for illustrated brochure. Johns-Manville, New York, Chicago, Cleveland, St. Louis, San Francisco.

EASY TO BOLT TO IRON



EASY TO SAW

EASY TO DRILL

EASY TO NAIL TO WOOD

Johns-Manville

88 YEARS OF SERVICE TO TRANSPORTATION

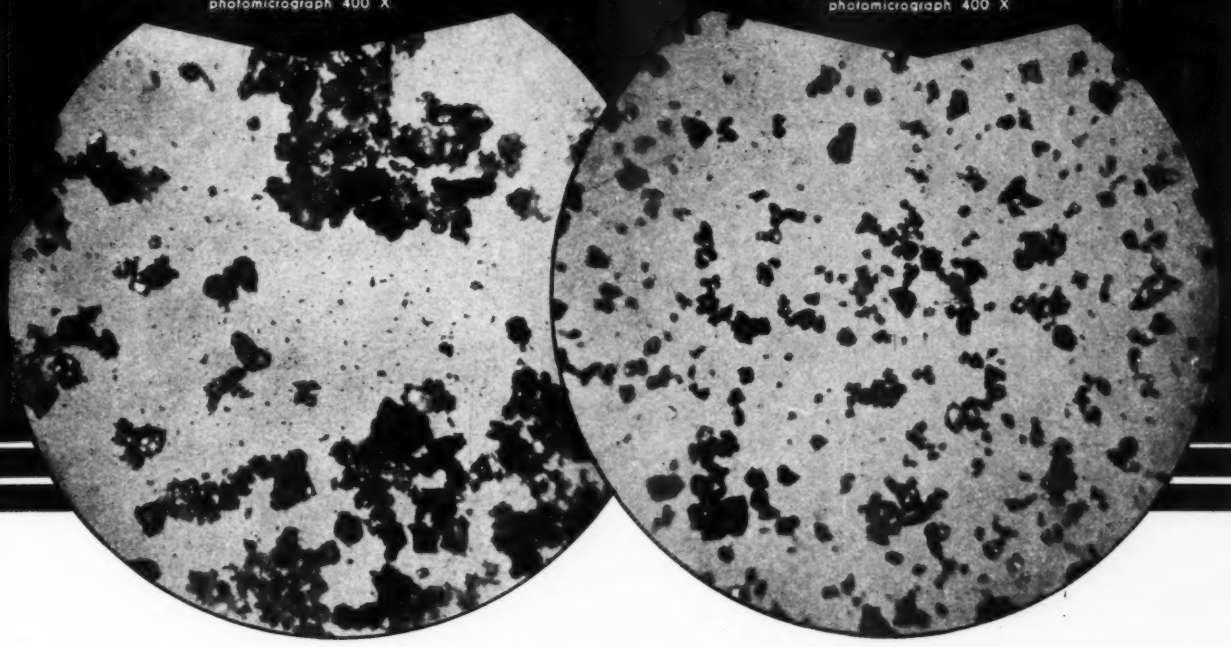
HERE IS WHAT'S BEHIND TODAY'S *NEW* CONCRETE STANDARDS

If you were to place a little Portland cement in water and look at it through a microscope you would see that the particles CLUMP together something like this, resulting in: (1) incomplete wetting of the particles (2) trapping of mixing water in the clumps.

photomicrograph 400 X

When Pozzolith, (Cement Dispersion) is added, the cement particles DISPERSE or SEPARATE like this, resulting in: (1) more complete wetting (hydration) of the particles, thereby putting more of the cement to work (2) release of the entrapped water, thereby reducing the amount of mixing water required.

photomicrograph 400 X



CEMENT DISPERSION OPENS THE WAY TO GREATER DURABILITY, STRENGTH AND LOWER COSTS

LIKE many other products, concrete has been improved greatly in recent years as the result of technologic progress. The outstanding development in concrete — cement dispersion — has made possible up to 500% increase in durability.

This important increase in durability is produced with these great advantages: (1) higher strength (2) easier placing even though water is reduced up to 15% (3) less bleeding — up to 50-60%. These results have been proved in millions of yards of concrete and confirmed by the Nation's top testing authority.

In addition to providing these new concrete standards, cement dispersion effects reductions in initial and long-term costs.

For detailed information on the advantages of cement dispersion, write for information and Pozzolith folder . . . today.

THE MASTER BUILDERS COMPANY

CLEVELAND 3, OHIO • TORONTO, ONTARIO

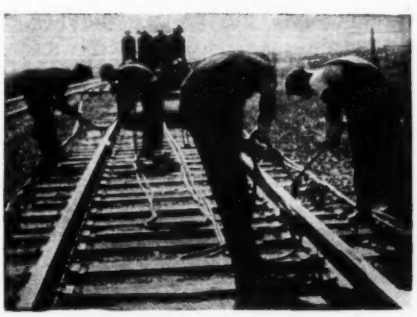
The Trend Is Toward . . .

POZZOLITH

MODERN AIRCO PROCESSES

Smooth the Way FOR TODAY'S STREAMLINERS

Building up Worn Rail Ends . . . a standard railroad practice, this economical oxyacetylene flame process contributes to smoother riding and "top" passenger comfort.



End Hardening New Rails . . . new main line rails are end hardened to prevent rail end batter — thus greatly extending service life and assuring maximum passenger safety.

Keeping today's streamliners rolling smoothly under the strain of excessive traffic and limited manpower calls for great ingenuity on the part of men charged with maintenance of way.

To accomplish the desired end of maximum speed and comfort — with maximum safety — more and more railroad maintenance of way engineers are turning to Airco oxyacetylene and electric arc processes. These processes save time, manpower and dollars in restoring battered rail ends, worn frogs, switch points, and work equipment.

Airco's Applied Engineering Department will be glad to aid railroad men in the application of Airco processes to any specific problem. For further information, call or write any Airco office, or write Dept. REM at New York.

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General Offices: 60 E. 42nd STREET, NEW YORK 17, N.Y.

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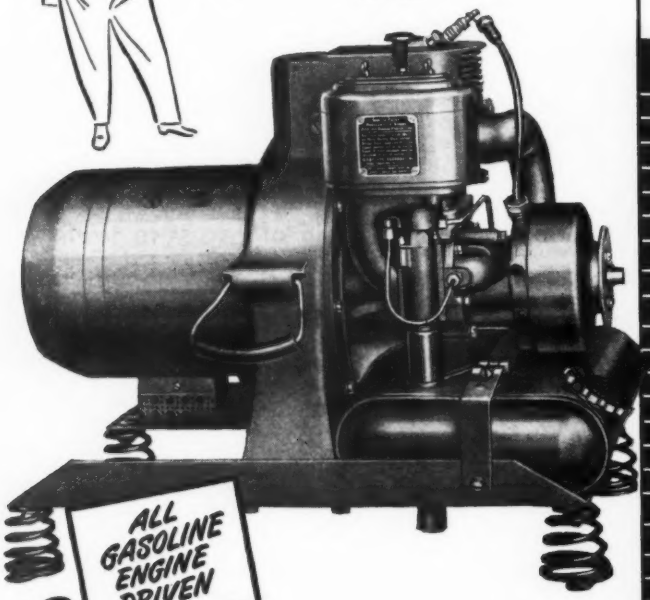
Represented Internationally by Airco Export Corporation, 33 West 42nd Street, New York 18, N. Y.

The Largest Line of HOMELITE GENERATORS Ever Offered...

ALL NEW...

ALL PORTABLE



ALL GASOLINE ENGINE DRIVEN

STANDARD MODELS NOW AVAILABLE

(Special units built to meet your requirements)

GENERATOR MODELS	VOLTS	AMPS.	WATTS UNITY PF
DC Compound Wound			
22D120	120	6.2	750
23D120	120	12.5	1500
21D120	120	16.7	2000
24D120	120	20.8	2500
25D120	120	33.4	4000
AC MODELS			
60 Cycle Single Phase			
22A115	115	4.3	500
23A115-11	115	8.7	1000
23A115-1	115	13	1500
21A115	115	15.6	1800
24A115	115	21.7	2500
25A115	115	34.8	4000
24A115/230	115/230	10.9	2500
25A115/230	115/230	17.4	4000
DC MODELS—Shunt Wound			
23D30	22-30	50	1500
24D30	22-30	83.3	2500
22D60	42-60	12.5	750
23D60	42-60	25	1500
21D60	42-60	33.3	2000
24D60	42-60	41.7	2500
25D60	42-60	66.7	4000
22D160	130-160	4.7	750
23D160	130-160	9.4	1500
21D160	130-160	12.5	2000
24D160	130-160	15.6	2500
25D160	130-160	25	4000
AC — 60 Cycle 3 Phase			
24A230	230	6.3	2500
25A230	230	10.0	4000
AC — 180 Cycle 3 Phase			
24AH230	230	6.3	2500
25AH230	230	10.0	4000

SEE WHAT THEY CAN DO FOR YOU

Send for Bulletin L-406 or better yet, arrange for a demonstration. The Homelite representative in your territory will gladly show you how Homelite Generators can be used for operating floodlights, power tools, or any electrical equipment, or for standby service to maintain lighting, communications, or similar services. Write today. No obligation.

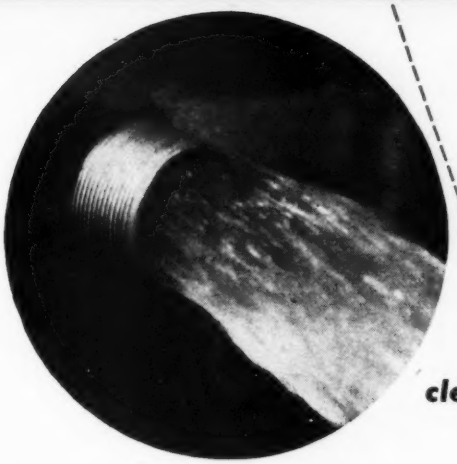
HOMELITE

CORPORATION

Portable PUMPS • GENERATORS • BLOWERS

PORT CHESTER, NEW YORK

DOWELL



for more water-faster!

clean your water lines—the chemical way

The Dowell method of chemically dissolving accumulated scale is the modern, rapid method of cleaning important water lines . . . under ground, above ground—indoors or out! Leading railroads, utilities and other industries have found it practical, reliable and economical.

Dowell specialists do the entire job—in a few hours. They chemically analyze samples of deposits taken from *your* lines, select the proper solvents—and bring with them all equipment needed to perform the thorough cleaning treatment.

Call the nearest Dowell office for a free estimate. Ask for your copy of "More Power to America's Industry"—new color booklet which describes the Dowell Chemical Service in more detail.

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Subsidiary of The Dow Chemical Company
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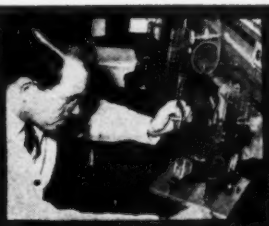
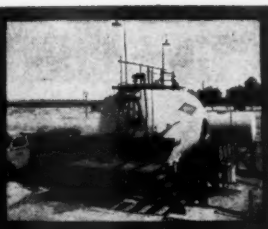
Long Beach, Casper: Dowell Affiliate—International Cementers, Inc.

SPECIALISTS IN CHEMICAL CLEANING SERVICE





DOWELL

DUFF NORTON
GENUINE BARRETT
TRACK JACKS
your Best Bet for

DEPENDABILITY
EASY OPERATION
LONG SERVICE LIFE

There is a safe, dependable Duff-Norton Track Jack for every job. The Single Acting Jack illustrated at right is ideal for *section gangs* since their work consists mainly of surfacing and lining, requiring only a low lift. The Double Acting Duff-Norton Track Jack is ideal for *extra gangs*—the load is raised on both the upward and downward strokes of the operating lever for high speed lifting. Write for the complete Duff-Norton Catalog.

Duff-Norton Genuine Barret Track Jack No. 117—Single Acting

The DUFF-NORTON MANUFACTURING COMPANY

PITTSBURGH, PA.

Canadian Plant:
COATICOOK, QUEBEC

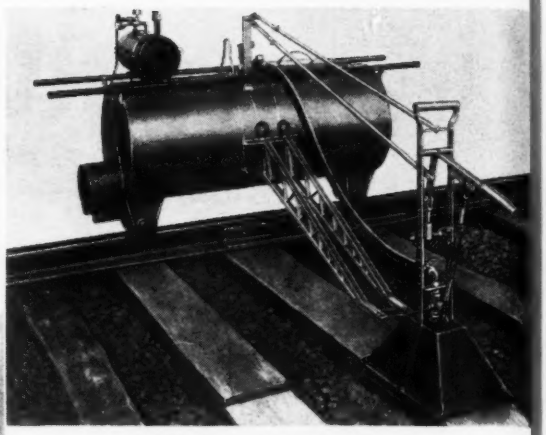
Representatives in Principal Cities

SERVICE THAT COUNTS

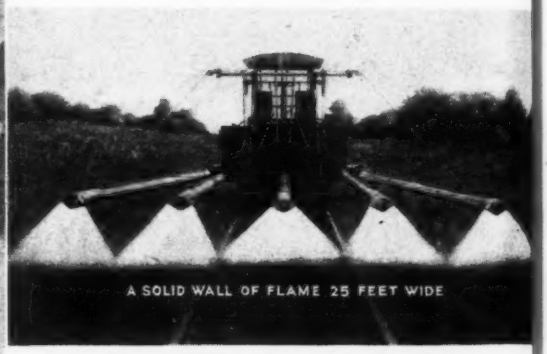
NEEDS GOOD TRACK MAINTENANCE

Customers of the Wabash are accustomed to get Service That Counts. To deliver this service, the Wabash knows that good track maintenance is essential. That is why WOOLERY Weed Burners and WOOLERY Creosote Sprayers are a part of their roadway maintenance equipment.

Because track maintenance is such an important factor in delivering good service, over 75 railroads use all types of WOOLERY Maintenance Equipment.



WOOLERY CREOSOTE SPRAYER



WOOLERY GIANT OCTOPUS WEED BURNER

WOOLERY WEED BURNERS

...re available in 5-burner, 3-...t, 2-burner and 1-burner models

WOOLERY MACHINE COMPANY

MINNEAPOLIS — Pioneer Manufacturers of — MINNESOTA

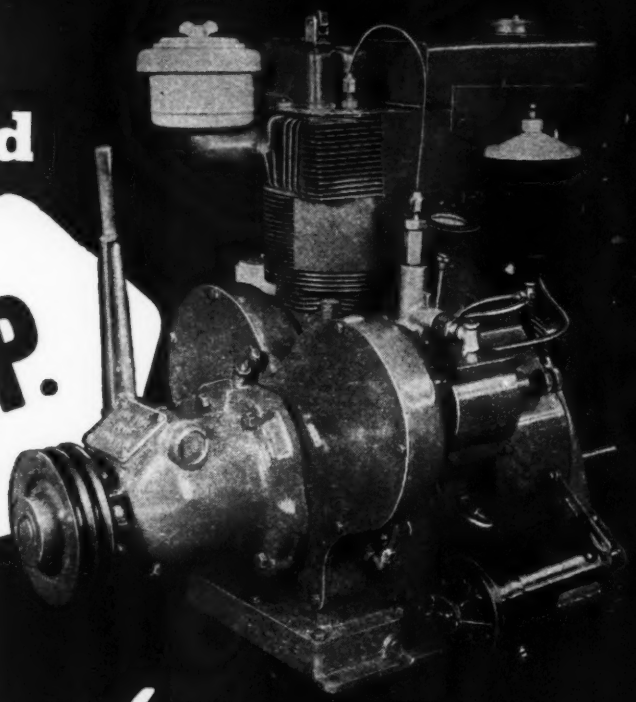
RAILWAY MAINTENANCE EQUIPMENT

RAILWAY WEED BURNERS • MOTOR CARS • TIE CUTTERS • TIE SCORING MACHINES • RAIL JOINT OILERS • CREOSOTE SPRAYERS • BOLT TIGHTENERS

EXCLUSIVE EXPORT REPRESENTATIVES: PRESSED STEEL CAR COMPANY, INC., PITTSBURGH, PENNA.

MEET THE BANTAMWEIGHT OF THE HEAVYWEIGHTS!

The New Air-Cooled 3¾ H.P. Sheppard DIESEL



For the first time, Diesel economy and dependability are available in a small engine.

The new Model 14 Sheppard Diesel is not only the smallest Diesel (both in size and H.P. rating) ever built for commercial use... but it's also the *only* stationary Diesel that is *air-cooled.*

This absence of a liquid cooling system reduces the size and weight of the unit... and, more important, the time required for servicing and maintenance.

Overall the engine stands 28½" high, 20¾" wide, 22½" long with crank removed. It is a single cylinder, 4-cycle Diesel... developing 3¾ continuous horsepower at 1800 R.P.M. Standard equipment includes both hand and 12-volt electric starting. The engine—including power take-off and clutch—is complete, ready to operate, when shipped from the factory.

An indication of its economical operation is its fuel tank—it holds 9/10 of a gallon!

The Sheppard Model 14 is ideal for powering communication systems, auxiliary or standby lighting plants, pumps, conveyors and other power-driven equipment that requires a steady, dependable power source.

If you need a small engine you can install and forget—the new 3¾ H.P. air-cooled Sheppard Diesel is the one to remember. For complete information about this revolutionary new engine—mail the coupon today.

Available direct-connected to a 2 KW generator.

POWER UNITS, 3¾ to 56 HP • GENERATING SETS, 2 to 36 KW

R. H. Sheppard Company
136 Middle Street, Hanover, Pa.

Please send complete information about the new air-cooled Sheppard Diesel Power Unit ☐ Generating Set ☐.

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*Company*_____

*Address*_____

DIESEL'S THE POWER... Sheppard's THE DIESEL!

Increased Ability!

- √ Wider cleaning range
- √ 25% more speed and greater screening capacity
- √ More horsepower
- √ Electric starting
- √ Improved accessibility of replacement parts
- √ Will clean intertrack ballast with track centers 12 to 15 ft.

RAILWAY MAINTENANCE CORP.

Pittsburgh 30, Pa.

AVAILABLE IN BORDER AND INTERTRACK MODELS

McWilliams "MOLE" cleans ballast better

Tough Journeys are Tough on Rolling Stock

The first important link in the journey from the factory to the front has been the railroads.

In the face of acute labor shortages . . .

In spite of facilities that are overtaxed and understaffed . . .

Handicapped by inadequate rolling stock, restricted construction and maintenance . . . the railroads have hung up an imposing record of delivering the goods to our armed forces everywhere.

They have met the pressing demands of troop transport. They have carried more civilian traffic than ever before.

During these trying times, when maintenance must be emphasized, railroad men rely even more on Flintkote Railroad Products.

Structures, rolling stock, right-of-way . . . wherever there is a requirement for protective maintenance, there is a Flintkote product to meet it.

One of the most important of these is Flintkote Car Cement—long produced to meet the individual requirements of many railroads.

You can apply it quickly, easily and economically with a trowel, brush or spray.

Wherever you have a problem of corrosion, a Flintkote Car Cement will give you sure protection. It provides a tough, pliable armor coat against flying cinders, rocks from the roadbed, etc.

Your specific problems are our concern. Give us your requirements. Complete information will follow.

TYPICAL APPLICATIONS OF FLINTKOTE CAR CEMENT

Underframes—all types of freight cars. *Box Cars*—outside roof . . . ends (side and end posts) . . . over coupler units at each end of floor line . . . inside, under wood lining (ends, sides and roof). *Gondola Cars*—over coupler units at each end of floor line . . . on underframes. *Hopper Cars*—underside of slope sheet . . . underframes . . . couplers.

FLINTKOTE INDUSTRIAL PRODUCTS

THE FLINTKOTE COMPANY · 30 Rockefeller Plaza, New York 20, N. Y.
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COMING IN FOR A

Safe Landing

with

BUDA

ALL STEEL BUMPING POSTS

Safe car landings in busy yards are certain with Buda All-Steel Bumping Posts. Constructed for maximum strength and simplicity, their design allows a remarkable degree of accident-causing *misuse*, without humping tracks or damaging the posts.

Installation involves no drilling, digging or cutting. A wrench is the only tool needed for placement, and the rugged steel clamps fit a wide range of rail sizes with equal effectiveness.

Original low cost and minimum installation expense are plus features in addition to permanent yard safety. Write BUDA for complete data.

The **BUDA** *Company*

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No. 205 of a Series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: Our New Year's Wish For You

January 1, 1946

Dear Readers:

At the beginning of another year, we of the staff of Railway Engineering and Maintenance want to congratulate each of you for your outstanding achievements of the last twelve months in the face of many difficulties, and to wish for you prosperity, happiness and success in your efforts in the year ahead.

And this same wish, equally sincere, goes to each of our friends in the railway supply industry—men who have stood shoulder to shoulder with you railroad men throughout the war years, and who now stand ready, as never before, to work with you in the solution of your new and equally difficult problems.

What has been accomplished during the last twelve months is history, and for the record is reviewed in this issue. But what really counts now is what lies ahead—how we, all of us who have a vital stake in the railway industry, rise to the challenge of the new era that is dawning—an era of intensive competition in transportation, of higher train speeds, of safer and more comfortable service, and withal, a degree of efficiency that has never been achieved in the past.

Before the war there were those who spoke of the railroads as a decadent industry. That they were wrong has been proved beyond shadow of doubt. Again now, there are those who see the railroads as outmoded. Will they be proved equally wrong?

As supervisory officers of the railways, you, the readers of this publication, hold a partial answer to that question. Much will depend on you, your foresight, your initiative, your ability and your determination. The year ahead will test your metal as it has not been tested before. It will also test the loyalty, aggressiveness and ingenuity of railway supply men, to develop and furnish the materials, tools and machines that will be necessary to enable you to accomplish the results that will be called for. It will test us too, in our responsibility to keep you informed about important developments in the industry and to bring to you monthly the most helpful information from the field.

Yes, 1946 for the railroads will be in large measure what we all make it. Let us, therefore, face it resolutely, for only in so doing dare we hope for prosperity, happiness and success in our efforts.

Sincerely,

Neal D. Howard
Editor

NDH:jb

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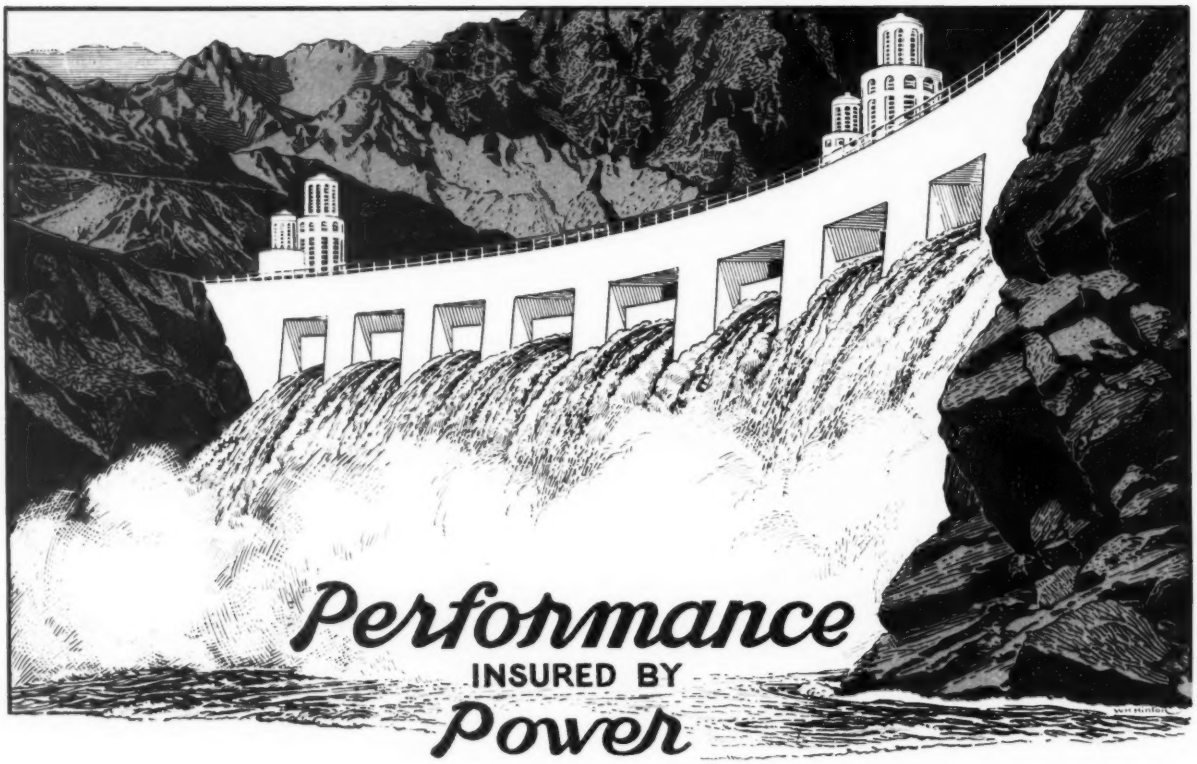

Water power is a mighty source of economical energy. Man's harnessing of flowing water, for usable power, is one of the oldest and most efficient methods of developing power. Efficient power for the rapid, safe, and economical transportation of large gangs or small gangs and for towing work equipment is augmented in a Fairmont Gang Car by our exclusive directional gear unit which gives operator the advantage of having all four speeds to use for reverse driving as well as for forward driving. Fairmont builds gang cars in the size and power capacity best suited for the job — three models, with 4 cylinder and 8 cylinder engines — four speeds forward and reverse.

Fairmont

Fairmont Railway Motors, Inc., Fairmont, Minn.

Fairmont's A5 Series C Gang Car seats eight men, with side steps added it will safely accommodate 18 men. Powered by a 31.5 H.P. industrial type, 4 cylinder engine with four-speed heavy duty transmission, the A5 is definitely a large gang car which has found great favor among railroad men. It has four speeds either way—forward or reverse, and is equipped with modern four-wheel self-centering brakes. Bulletin 385 gives complete details.

Performance
ON THE JOB COUNTS

OF ALL THE CARS IN SERVICE TODAY . . . MORE THAN HALF ARE FAIRMONTS

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

JANUARY, 1946

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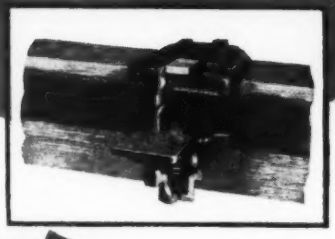
Complete Protection

for hand thrown switches with Racor switch point locks

Now, main line facing point switches can positively be held in a closed position — regardless of failure or damage of any part of the switch throwing mechanism.

Racor Switch Point Lock operates independently of the switch stand and is protected from damage because all essential working parts are installed below the top of the ties. Adjustable lock rod permits easy and accurate installation of these locks to any design of switch or switch stand. Will not interfere with normal operation of stand as it can be released by slight foot pressure on a conveniently located treadle.

FIG. 3911
(Patented)



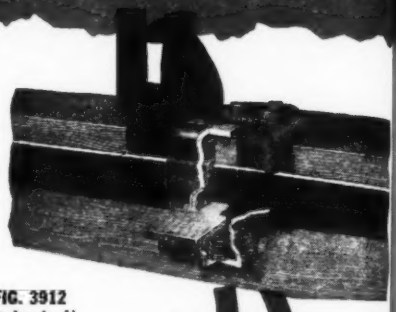
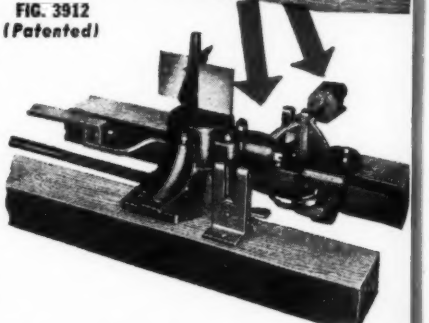


FIG. 3912
(Patented)



TWO STYLES AVAILABLE

Fig. 3911 above, for use with all types of column throw switches. Note how lockrod is securely engaged in lock treadle. Hand lever may also be padlocked if desired. Fig. 3912 at right, for use with all types of ground throw switches. On this type of lock, one padlock provides positive locking of both lockrod and hand lever.

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Railway Engineering and Maintenance

1945 In Review—

Railways Over the Hump in War-Time Effort

The year 1945, with the victorious conclusion of two wars that held the world within their grip for nearly six years, saw some overall relief for the American railroads after reaching all-time peaks of effort and achievement in 1944. However, the year as a whole was not without conditions and developments that put a heavy strain on the roads during certain periods, and which at times taxed them as severely as at any time since the upward surge of traffic that followed "Pearl Harbor" in 1941.

What took place during the year, which affected, and which was influenced to some extent by, every maintenance of way officer on the railways, is pointed out briefly in the following comments and statistics taken from a comprehensive review of railway operations in 1945, prepared by Dr. Julius H. Parmelee, director of the Bureau of Railway Economics of the Association of American Railroads.

The year opened with record snows in certain Northeastern states, producing unfavorable conditions throughout January and February, which, together with persistent shortages in man-power, led to the most critical operating conditions of the entire war period. Notwithstanding these conditions, the railroads established new records for unloads of war materials at the coast ports in the first two months of the year, and went on to new heights in March and April.

Following V-E Day, war activities in the Pacific area were greatly intensified, which involved sharp increases in war goods moving to the West Coast ports, as well as stepped-up movements of troops and naval personnel, all requiring long hauls. As a result, unloads at West Coast ports in May and June were 21 per cent greater than the previous highs established during March and April.

V-J Day brought new problems. With only a small part of the huge task of bringing our men home from Europe accomplished, the tide of movements to the West Coast was turned, with the result that a new high tide in organized troop movements was reached in August, both in terms of men and miles. But for the year as a whole, the total volume of both freight and passenger traffic was off from the peaks reached in 1944, the net results of the year's operations showing a decline of about 3.3 per cent in freight car loadings, a decrease of about 8 per cent in ton-miles, and a drop of about 5 per cent in passenger-miles.

More specifically, total car loadings of revenue freight handled by the Class I roads in 1945 aggregated approximately 42,000,000 cars, which was a decrease of 1,441,000 cars below 1944; tons of revenue freight carried one mile approximated 680 billion in 1945, a decline of about 57,600,000 from the 737.6 billion mark established in 1944; and passenger-miles for the year aggregated 91 billion, compared with approximately 85.6 billion in 1944.

From a financial viewpoint, 1945 was characterized by declining operating revenues following V-J Day and by increasing operating expenses throughout the year. Net earnings declined for the third consecutive year, producing a rate of return of about 3½ per cent on property investment.

Altogether, 1945 was a successful, though strenuous, year for the railways. Operating in their stride, in spite of many difficulties, they hastened the arrival of both V-E and V-J Days. Had they failed, there may well have been no V-E or V-J Days, either past or in the future. For their part in this achievement, the maintenance of way and structures forces of the railways may justly be proud.

The Year 1945—

In Maintenance and Construction

FOR MILLIONS of Americans 1945 was a year of striking contrasts. Victory over Germany and Japan changed the thinking and activities of nearly 11,000,000 men and women in the armed services, and the daily routine of many times that many employed in munitions plants, shipyards and most other war industries. But not so for most of those engaged on the railroads. For them the war had meant more than three and one-half years of intensive operations to meet the all-time peak demands of the country's war effort, and except for a whoop and a hurrah on V-E Day, and another on V-J Day, the remainder of the year was largely a repetition of the earlier months, with continued intensive operations and maintenance effort, with little, if any, relief in their primary needs.

For those in the construction and maintenance departments, the entire year was one of exacting demands in the face of many difficulties—demands due to the need for new and improved facilities and the high standard of maintenance required by the heavy traffic prevailing, and difficulties due to continuing shortages in essential materials, work equipment and man-power, as well as other difficulties occasioned by traffic interferences with many work operations. But looking back, along with others on the railways, the construction and maintenance forces can say that they "saw it through," and ended the year ready to face the transition and peace-time problems of the year ahead with the same fortitude and determination that enabled the railways to achieve their outstanding records of performance during the war period.

Maintenance Expenditures at All-Time High

The most significant fact as regards the activities of the maintenance of way and structures departments during 1945 is that, for the third consecutive year, total expenditures by these departments again attained a new all-time high. Based on official figures of expenditures for the first nine months, it is estimated that total expenditures of the Class I railways for maintenance of way and structures for the entire year amounted to approximately $1,360,000,000. This was $96,708,000, or 7.7 per cent, higher than the comparable expenditures made during 1944, and $251,719,000, or nearly 23 per cent, above those made in 1943. Significant too, in indicating the relative maintenance activity of the year with that of earlier periods, is the fact that the 1945 expenditures were nearly one and two-thirds times the average annual expenditures during the relatively intensive period 1925-1929, inclusive, and were nearly four and one-quarter times those of 1933, the low point of the depression years.

Viewed in any light, such expenditures as those during 1945 are impressive, and represent a large volume of productive work. However, in determining their true value, and in making a true comparison with earlier years, especially as indicating the relative productive activity of the different years, allowance must be made for the fact that the estimated total expenditures for 1945 not only show the influence of the various factors that have afflicted the totals for several years in the past, but that, as a result of the end of the war, one of these factors —charges in connection with the amortization of defense projects—was present to an enlarged degree during the closing months of the year. Also, as in 1943 and 1944, the total expenditures for 1945 included substantially higher charges for depreciation of roadway property than had been made in prior years, and continued to be affected by various other influences that have tended during the war years to reduce the effectiveness of the maintenance dollar.

In the light of these considerations, the expenditures for maintenance of way and structures in 1945 are not as impressive as at first glance, either alone or in comparison with earlier years, and especially when it is recognized that, as in the earlier war years, they represent substantially unbalanced programs of work in some respects, with weakness in certain phases that, under more normal conditions of materials and labor, would have been given major attention. The probability is, therefore, that, on the whole, the amount of maintenance work performed during 1945 was no more than sufficient to compensate for the heavy wear and tear of the heavy volume of traffic carried during the year, with little or no progress being made in overcoming lost ground during the earlier war years.

Construction Activity at Moderate Level

During 1945 railway construction activity involving additions and betterments to the fixed properties continued at about the same level as in 1944, with the total expenditures for this purpose amounting to approximately $250,000,000. Thus, as in the earlier years of the war, the volume of improvement work carried out by the railroads remained at a moderately higher level than during the 10 years immediately preceding the war, when expenditures for such work averaged somewhat less than $135,000,000 annually. This does not mean, however, that any great amount of progress was made in recent years in reducing the backlog of needed improvement work that accumulated during the earlier period of relative inactivity, or that any appreciable work was carried out in anticipation of future needs.

Following the precedent set during the earlier war years, railway construction during 1945 consisted almost exclusively of those types designed to speed the movement of cars through yards and of trains on the roads, as well as numerous projects to facilitate the servicing of locomotives, and others to shorten the period required for the repair of cars and locomotives. This situation prevailed for two reasons—first, to give pre-eminent place to the movement of war traffic without delays, and second, because of the shortages of labor and materials, and government restrictions on construction work, which would not permit the undertaking of many projects that would have been carried out under normal conditions.

This meant that while the immediate needs of war traffic were taken care of, very little progress was made in carrying out improvements designed to reduce costs through greater efficiency or to enhance the attractiveness of railroad service generally—improvements that are recognized as necessary to strengthen the competitive position of the railroads in the post-war period. In fact, in this latter regard, many roads have a long way to go to equip themselves adequately for the intensive competition that lies ahead in the transportation field—a situation which is certain to see a substantial increase in many types of rail-

was construction activity during the coming few years.

At no time since the beginning of the war did the railways obtain as much rail as they estimated would be required to meet their minimum needs, and 1945 was no exception. For the two years 1942 and 1943, the total quantity of rail made available was nearly a million tons short of estimated minimum requirements. In 1944, in the face of estimated requirements of 2,600,000 net tons, the roads received only 1,874,000 tons. Nor did they fare any better in 1945, because while they estimated their needs at a minimum of 2,900,000 net tons in that year, they actually received only about 1,875,000 tons, or practically the same amount as in 1944.

The crosstie situation continued to be a source of considerable concern during 1945 in the face of difficulties in tie procurements, especially during the first half of the year. As a result of these difficulties and, in part, shortages in track labor, tie renewals during the year amounted to approximately 44,770,000 ties, which was 3,263,000, or 6.8 per cent, less than the number of insertions in 1944. Moreover, 1945 renewals were less than for any year since 1940.

Generally speaking, therefore, it is apparent that the roads as a whole fell considerably short of making as many tie renewals in 1945 as were needed to maintain their properties, although it is recognized that some lines fared better than others in this respect. Still more serious are present indications that the supply of crossties will continue to be limited to some extent in 1946, restricting renewals in that year, with the prospect that during the next twelve months the railways can expect to make little, if any, progress in overcoming the deferred maintenance in the condition of their ties that accumulated during the war years.

Labor Shortages Throughout the Year

The labor situation throughout 1945 presented one of the most serious problems of the year to the maintenance of way and structures forces, not only before V-J Day, but following it as well. At the opening of the working season on the track in many parts of the country, the man-power situation showed some improvement over that which existed the previous fall and a full year earlier, and considerable improvement over the situation that prevailed during the most acute shortage in maintenance labor, in October, 1943, but it was still definitely bad, and continued to get worse with the advancement of the season until after V-J Day. Since that time the situation has improved somewhat, but late reports from roads in various parts of the country, even after the close of the heavy working season, showed shortages still widespread in some categories, although varying widely with general or local conditions.

Many factors combined to present the still generally unfavorable labor picture that prevailed at the end of the year, including the slow rate with which veterans were returning to roadway and structures work; the trend for many workers to seek employment at higher wages, in work of a less arduous nature, and in or near urban communities; and the hesitancy on the part of many war workers, though unemployed, to accept jobs of any kind for the time being.

But one of the most far-reaching factors affecting the maintenance of way labor situation at the close of the year, and certain to carry its influence over well into the new year, was the hasty ruling of the War Manpower Commission immediately after V-J Day calling for the prompt return to Mexico of the Mexican Nationals that were brought into the country for railroad work as a war measure. From a peak at one time of more than 68,500 on as many as 34 roads, there were approximately 63,400 of these Mexicans under contract on the railways on V-J Day, a number that it was expected could be reduced to about 20,000 by December 1, under the rate of contract terminations and deportations set up, looking to having the last of these workers back over the border by the end of February, 1946. However, due to the inability of the Mexican railways to handle the returning Nationals at the rate contemplated, there were still approximately 45,000 Mexicans in the country on December 1.

The Prospects for 1946

What is ahead for the construction and maintenance forces in 1946? With so many uncertainties on the horizon, any prediction in this regard at this time can be little more than a "shot in the dark." Early in the year, however, as during the last four years, it is certain that the ability of the railways to secure needed materials, such as rail, ties, lumber and structural steel, will exercise an important influence on the amount of both construction and maintenance that can be undertaken. Likewise, the availability of adequate labor, and needed power tools and machines, is certain to influence the amount of work that can be put under way during at least the next few months.

After that, with the prospect that the general labor situation will improve, and that the wheels of reconversion in industry will truly get under way, turning out the huge pent-up material needs of the country, including those of the railways, the prospects for enlarged railway construction and maintenance programs are bright. One thing is beyond question, and that is that there is much railway construction and maintenance to be done—which must be done if the railways are to remain in the forefront of the transportation of the country.

Annual Index—

If You Wish One, Be Sure To Ask For It

BEGINNING last year, in the interest of conserving paper, which at the time was critically short, *Railway Engineering and Maintenance* stopped mailing its annual index to all subscribers as a part of the January issue. Instead, only sufficient copies were printed to meet the needs of those subscribers who made specific requests for them.

This year the paper shortage is over, but the plan of last year worked so well, with no apparent disadvantage to anyone, that we are continuing it another year. The 1945 index is now being compiled. If you requested a copy of the index last year, you will receive a copy of the new index automatically, just as soon as it comes from the presses. If you did not request a copy a year ago, but want a copy of the 1945 index, all you need do is ask for it, directing your request to H. E. McCandless, circulation manager, 30 Church Street, New York 7, N. Y.

Railways Spent $17,500,000

During 1945 a Total of 172 Railways in the United States and Canada Purchased Approximately 12,000 Power Machines and Tools, More Than in Any Previous Year. Budgets for 1946 Call for Continued Purchases at a High Level

CONFRONTED with a continuing acute shortage of labor in 1945 for the maintenance of their fixed properties and, at the same time, faced with increasing demands for more and better maintenance to insure uninterrupted flow of the heavy traffic imposed on them, the railways last year, of necessity, turned to power machines and tools to a greater extent than ever before as the only means by which they could produce more work with fewer men.

That this action was not sporadic, but general, is attested by the fact that 172 railways in the United States and Canada reported the purchase of 11,733 units of work equipment in 1945. This is not only the largest number of units ever to be purchased in a single year, but it is also the largest number of railways to report such purchases. It compares with 9,984 units purchased in 1944, an increase of 1,749 units, compared with last year, and of 3,226, compared with 1943.

Labor Was Ineffective

In considering the desperate need of the railways for an increased amount of maintenance, it should not be overlooked that, in addition to an acute shortage of labor that prevailed, measured by the number of men they were able to employ, an astonishingly large part of the forces at their disposal consisted of men who were well past their prime, and unable therefore to maintain the production level of the younger men who were no longer available to them. Besides, a considerable number of the men who were taken on during the emergency were not experienced in railway work, a fact that was responsible for a still further lowering of production.

Under these conditions, increased use of power equipment offered the only alternative to a complete breakdown of maintenance operations. Fortunately, in the liberal purchases of work equipment that had been made during the preceding five years, the railways had a good start toward mechanization. The power units in service at the beginning of the year were not sufficient, however, to carry the roads through the difficult year that confronted them, for, as has been pointed out repeatedly in these columns, no road possessed a sufficient number of power machines and tools to meet all of its needs and, on most roads, the ownership of this equipment was not well balanced.

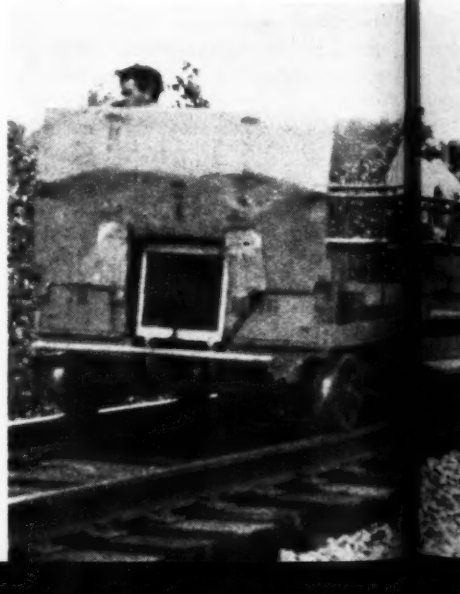
All of the evidence at hand at this time points to the probability that the railways will require as much, or more, work equipment in 1946 as they purchased in 1945, partly to replace equipment that has been used so intensively that it must be retired; partly to offset the inadequate forces that are in prospect for the year; and in large part to increase still further the efficiency with which work can be carried out. While most roads have not completed their work-equipment budgets for the coming year, or have not yet authorized them, enough of them have done so to confirm the foregoing prediction, and to indicate quite clearly that the purchases of power machines and tools in 1946 will be made on a liberal scale, comparable with, if not exceeding, the purchases made in 1945.

At the beginning of 1944 many contractors who had been engaged in the construction of war plants, cantonments, arsenals and other military facilities were left with much used equipment on their hands, for which they had no immediate use. The result was that, in that year, and to a much smaller extent in 1945, purchases of this used equipment, largely earth-moving units and cranes, were made by the railways where new units of the desired types were not available.

Although these purchases proved generally beneficial to the roads, all of this equipment had been used intensively and much of it had suffered from abuse, with the result that many of the units purchased proved a liability rather than an asset. With the close of the war the army is in possession of a large surplus of such equipment, which it is offering for sale to civilians, and the railways are likely to be solicited to purchase a considerable amount of it. If they are, they should approach the matter of making such purchases with a great deal of caution, for a large part of the equipment so offered has been handled by inexperienced operators under conditions that were generally conducive to abuse and inadequate maintenance. As a matter of fact, little of that which has already been offered has been in even moderately good condition.

Trends Are Discernible

There have always been certain trends discernible in the purchases of work equipment and, while these vary somewhat from year to year, yet they remain about the same basically in that they include primarily machines and tools that are designed to ease the burden of labor or to perform tasks that cannot be done by hand. Units in this category include cranes, pile drivers, snow plows, wrecking derricks, large earth-moving machines and other



for Work Equipment in 1945

larger units. In addition, many other types that are helpful in assisting the men actually employed to get greater production or to do their work with less manual effort, have been increasing in favor. This has been particularly noticeable during recent years when the shortage of labor continued to grow more and more acute, and is illustrated also in the growing number of types that have been purchased year by year, as well as by the steadily increasing number of such units. In 1943 a total of 133 types of power machines were purchased; this was increased to 149 in 1944 and to 160 in 1945.

Purchases Are Impressive

Taken alone, the purchases of 11,733 units of work equipment would be a matter of outstanding interest to manufacturers and the railways alike, as well as to those particularly interested in the economics of rail transportation. Purchases of this magnitude become still more impressive, however, when it is recalled that in the eight years immediately preceding 1945, a total of 47,757 power machines and tools had been purchased by the railways at a cost of $57,900,000, and that the purchases of 1945 bring the total number of units acquired during the nine-year period to 59,490, and the cost to $75,400,000.

It should be kept in mind, however, that not all of these machines were intended as additions to the equipment already owned, for many of them were for the purpose of replacing similar units that became obsolete or were worn out under the intensive use to which they were subjected. On the other hand, many of those that were acquired in 1945 were primarily additions to offset the lack of sufficient labor, rather than for replacements, for only those machines were retired that could not be reconditioned to be continued in service or that could not be operated without hazard. On this basis, it is estimated that the purchases made in 1945 bring the total investment in work equipment to $135,000,000.

One of the outstanding features that has characterized the use of work equipment during the third of a century since it first began to receive acceptance among maintenance officers has been the almost constant

Right—Large Amounts of Equipment Used for Laying Rail Were Acquired in 1945. Below—Much Surfacing Equipment, Particularly Tie Tampers, Was Purchased. Below, Left—The Railroads Continued to Acquire Large Numbers of Motor Cars and Trailers

expansion of its use, which has been interrupted only once, during the early years of the depression. It is a tribute to the manufacturers that one of the important features that has always characterized both the production and use of power machines and power tools, and which has exerted a powerful influence on the expansion in its use, is the manner in which they have striven constantly to improve their machines, both physically to increase their dependability and to facilitate their maintenance, and from the standpoint of operation, to increase their efficiency as well as to make operation easier.

Source of Information

To obtain the information that is given in detail on the following pages, inquiry was made of all of the railways in the United States, Canada and Mexico concerning their purchases of work equipment. Replies were received from 401 roads representing more than 78 per cent of all of the railways in these three countries and including all but three Class I roads in the United States and one in Canada. Of this number, 172 roads reported purchases of work equipment. This was an increase of 15 over the number that reported purchases in 1944 and of 39 over those that reported purchases in 1943. It is obvious that if reports had been received from the four Class I roads which did not make report, the total purchases reported would have gone well beyond 12,000 units, for all of these roads have purchased work equipment liberally in the past.

As has been mentioned repeatedly in these columns, obsolescence, for a number of years after work equipment had established itself, had no part in the thinking of maintenance officers; in fact, few of them understood its importance or what the term implied. For this reason, for a number of years obsolescence was not considered as a possible reason for the retirement of a power machine or a power tool, and once such a machine or tool was acquired, it was used until it was so worn that it could no longer be repaired, or until it could not be used without creating a hazard.

Equipment Below Needs

The reasons for this become perfectly clear when it is remembered that the number of machines and tools in service at any time was so completely inadequate that inherent efficiency was not a factor in considering their retirement, but rather their efficiency compared with hand labor. Furthermore, any new units that could be obtained could be scheduled as additions.

Today, although many maintenance officers still do not understand all that obsolescence implies, and although most roads have been disregarding it because it has been essential to keep every machine in service as long as it could be used effectively, regardless of any considerations of economy, it may be expected that in the immediate future, as conditions become more normal, there will be an upsurge of retirements that have been held in abeyance as a matter of necessity, many of which will be based on obsolescence.

Consistently, year by year, one of the striking examples of the purchases of work equipment is the number of motor cars bought; in fact, in every year since this record was started, they have led all other types in the number of units purchased. This is a complete refutation of the contention of some manufacturers of other types of equipment that, owing to the rate at which the railways have been purchasing work equipment during the last four or five years, the saturation point for certain types will soon be reached and that the market will then be closed for those types, or that the demand for them will be so restricted that there will be no incentive to continue their manufacture. The very fact that motor cars continue to lead all other types, demonstrates that these fears are groundless, for they represent the only type that is in universal use.

All for Replacement

There can be no dispute that, except for a negligible number of inspection cars and a few heavy-duty cars that are bought to serve large gangs, all of the motor cars that are purchased year by year are for replacement only. It becomes of special interest, therefore, that the purchases of motor cars in 1945 aggregated 2,738, and that this followed purchases aggregating 3,131 cars in 1944 and 3,239, an all time record, in 1943. In addition, 1,192 push cars and motor-car trailers were purchased in 1945, compared with 1,374 in 1944, and 1,130 in 1943.

The only other type of equipment that has progressed well toward the point of saturation, if there be such a point, is tie tampers, although they are still far from this point as is evidenced by the strength of the market for them. Yet, they provide almost as good an example of the continuing need for mechanical aid in maintenance as motor cars, for this equipment has now been in use for a third of a century and has been used more widely than any other type, except motor cars.

Furthermore, despite the self-imposed restrictions on their use for some years after they became available, owing to the fact that early designs were too heavy and cumbersome for assignment to any but the largest gangs, the value of tie-tamping equipment has been demonstrated so clearly that all but a few minor roads have bought it liberally in recent years, especially since the unit tamper and the small four-tool outfits, both suitable for use by section gangs, became available.

Yet the fact that the purchases of this equipment in 1945 amounted to 1,320 complete tie-tamping outfits, ranging in size from 4 to 16 tools, and 876 unit tampers, is a clear indication that the point of saturation for this equipment has not yet even been approached. This is confirmed further by the fact that the budgets for 1946 that have been completed give a large place to this equipment.

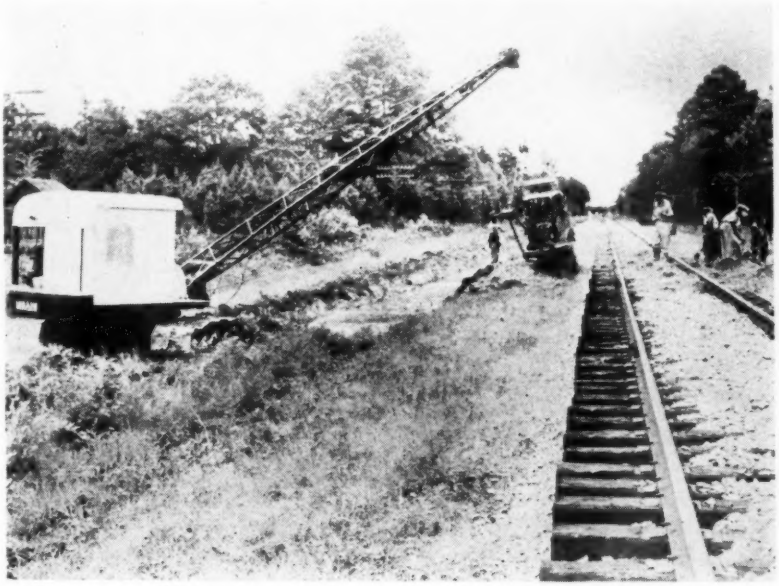
Welding outfits, paint spraying outfits, sand-blast plants, portable electric-lighting plants and tie-tamping outfits all include the power plants necessary for their operation. On the other hand, the railways purchase every year, independently of the foregoing outfits, a considerable number of air compressors and generators which are intended for the replacement of worn-out units of the same type. In general, however, most of these independent power plants are evidently purchased for the purpose of extending the use of small portable hand tools, used principally by the bridge and building forces. This is indicated by the large number of these tools that are purchased each year. In continuation of this trend, in 1945 the railways purchased 201 air compressors and 266 generators, compared with 67 and 85, respectively, in 1944.

Grading Units Popular

For the sixth consecutive year the railways have maintained their interest in earth-moving equipment by making liberal purchases of units falling in this category, to a total of 505. These purchases indicate a continuation of the important work of strengthening the roadbed by widening embankments and through better surface drainage, as well as to smooth the right of way to provide this drainage, to eliminate a considerable amount of snow trouble

and to facilitate mowing and policing.

The 505 units purchased in 1945 represented 256 more than were purchased in 1944. Included in this total were 32 draglines, 14 power shovels, 188 tractors, and 214 miscellaneous units, consisting of angle and bulldozers, scrapers, sheepfoot rollers, road rollers, graders and other similar types. It also included 50 dump trucks and 7 spreaders. As might be expected, in view of the density of traffic during the year, all of the mobile units had off-track mountings, except the spreaders.



The Railroads Continued to Make Liberal Purchases of Grading Equipment of All Types.

Not the least of the important maintenance tasks of the year was the installation of more than 1,622,000 gross tons of new rail and the laying in secondary lines of a large part of the rail thus released. In preparation for this work, 1,447 units of rail-laying equipment were purchased, 259 more than were purchased in 1944. These included spike pullers, bolt tighteners, adzing machines, rail cranes, spike drivers, rail and bonding drills and rail grinders.

Although less ballast was applied in 1945 than was hoped for at the beginning of the year, largely because of the continued labor shortage, this feature of maintenance was by no means neglected, for in addition to that applied with new or released rail, many miles of track were given additional ballast in connection with general surfacing. For this work, in addition to the tie-tamping equipment that has already been mentioned, the railways purchased 111 units of other equipment, including ballast cleaners, power ballasters and power jacks, which was not only the largest number ever to be purchased in a single year, but more than double the number purchased in 1944, which heretofore had been the record year.

Better Policing in 1945

Almost as far as can be remembered, it has been customary in times of labor shortages to eliminate the policing of station grounds and the right of way, on the ground that this required the use of labor that was more essential for other work. However, the present generation of maintenance officers has a vivid recollection of the appearance of the track, of the right of way and of station grounds during the depth of the depression, and of the task involved in cleaning them up after increased revenues made it possible to do so, with the result that today these officers look upon weed destruction as one of the important items of their maintenance programs.

Weed-Destroying Equipment

To avoid a repetition of this experience and to continue the work of policing the property in a normal manner, as has now been done consistently for several years, the railways purchased 279 units of weed-destroying equipment in 1945. Included in these purchases were discers, scarifiers, extinguisher cars, mowing machines, tractor-mounted mowers, portable weed sprayers, weed burners, and a few rail-mounted spraying outfits.

Owing to the unusual density of traffic and the almost complete curtailment of local passenger traffic, maintenance officers have experienced much difficulty in the transportation of both men and materials for making repairs to buildings and water-service facilities. This situation has been particularly aggravating where minor repairs have been required which needed only one to three or four men, and in emergencies which involved locomotive water supplies.

Because of these difficulties and the ensuing delays to the work and loss of time by the men, many roads have found it necessary to handle both men and materials for such work by highway. Despite the restrictions that were in effect during most of the year on the manufacture and purchase of highway vehicles, the railways were able to make a sufficiently strong showing of their needs to obtain 350 motor trucks and 60 other highway vehicles, including automobiles, station wagons and buses.

A larger number of cranes of all types were purchased in 1945 than in any previous year, the total being 119. This figure includes 32 rail cranes, but does not include derrick cars and truck-mounted cranes, a considerable number of which were also purchased.

Many Other Types

Other types of equipment purchased during the year, but which cannot be discussed in detail, included concrete mixers, concrete vibrators, paint spray outfits, portable pumps, rail and flange lubricators, rail saws, timber saws, and snow plows to the number of 37, of which two were rail mounted, while the remainder were either truck or tractor mounted. They also included snow sweepers, tie borers, tie pullers, tie saws, welding outfits, wood borers and power wrenches.

This year, for the first time since this record was started, the detailed list of purchases by individual roads is omitted. This detailed list served a purpose of great value when the record was started and for several years thereafter, for it emphasized the extensive purchases that were being made by those roads that had been using power machines and tools the longest, and at the same time directed attention to the growing list of roads that were purchasing such equipment as an aid to their maintenance operations.

Looking North Over a Part of the South Approach and the Main River Spans of the Cairo Bridge

ILLINOIS CENTRAL

Overcomes Adverse Conditions On Cairo Bridge

Part I

This article as a whole tells how the Illinois Central overcame two serious rail problems on its long multiple-span bridge over the Ohio river at Cairo, Ill.—impact, due to battered rail joints on the river spans, which was overcome by laying continuous pressure butt-welded rail on these spans; and tie plate cutting and resulting wide gage on the long curved south approach viaduct to the river crossing, which were overcome by the installation of special fabric abrasion pads beneath all GEO tie plates. In this part of the article, major consideration is given to the solution of the problem on the south approach. Part II, to appear in a subsequent article, will describe the installation of continuous butt-welded rails on the river spans.

AFTER more than 16 month's service, two expedients employed to overcome two increasingly serious track problems on the Illinois Central's long, multiple-span, high-level, single-track bridge over the Ohio river at Cairo, Ill., appear to be proving themselves fully effective. One of these problems, which was confined primarily to the bridge proper, was the pounding of wheel loads at rail ends. The other problem, which was confined to the long curved south viaduct approach to the river spans, was the severe and uneven cutting of the tie plates into the bridge ties, which was not only destroying the ties prematurely, but, of more immediate consequence, was bringing about an increasingly serious wide gage condition on the curve.

Briefly, the former of these problems was overcome by replacing the well-worn 90-lb., 39-ft. rails which were on the river spans, with a series of continuous pressure butt-welded 112-lb. rails, up to 1,058 ft. in length, which are separated by switch-point-type expansion joints to take care of expansion and contraction in the

various spans. The tie cutting and wide-gage problem on the south approach has been overcome by the re-establishing of level tie plate seats by mechanical adzing of the ties, and the insertion of Fabreeka pads between the tie plates and the ties before the rail was set back into place. The rails on the south approach are held in GEO-type track construction, in which the tie plates are secured to the ties by lag screws. This may be a factor in the results that are being secured, but it is not without significance that this type of construction had been in the south approach track for the last nine years and had not, in itself, prevented the continued tie cutting and tendency toward wide gage.

Since the installation of the continuous rail on the river spans, rail end batter and impact due to normal rail joint construction have been eliminated, and since the installation of the Fabreeka pads on the south approach, now a matter of 16 months, both tie plate cutting and the resulting gage widening have, for all practical purposes, been stopped. In the light of these results, the disadvantages of rail end batter have been overcome, and through the stopping of the tie plate cutting of the approach viaduct ties, the life of these ties, which was being rapidly dissipated, has been increased materially.

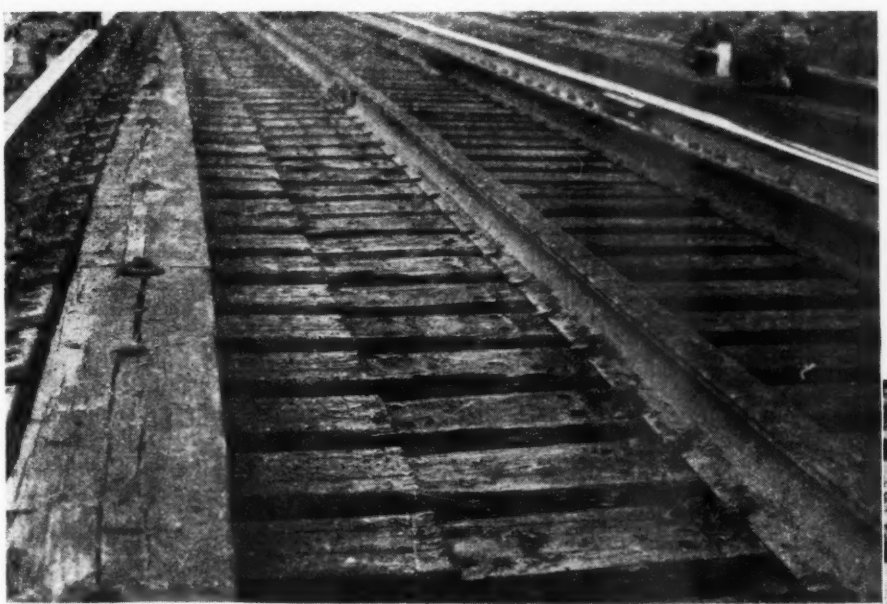
The Cairo bridge of the Illinois Central, extending between Illinois and Kentucky, is an eleven-span truss structure, with nine main through-truss river spans and two flanking deck-truss spans at the ends. Of the through spans, seven are 400 ft. long and two are approximately 518 ft. long. With the end deck-truss spans, each of which is 250 ft. long, the structure as a whole has a length of 4,393 ft. Throughout its length it is on a level grade.

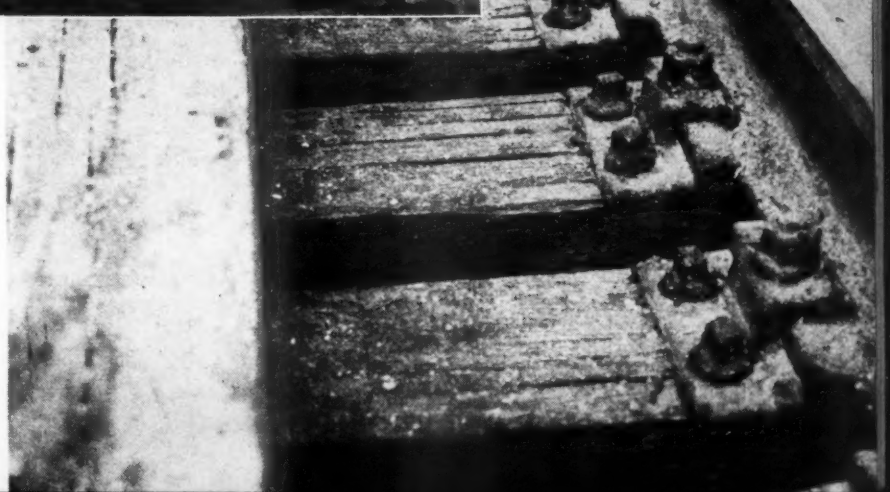
Beyond the north-end (timetable direction) deck-truss span, the bridge is approached over a long double-track embankment in a curve from the north, extending to a double-track span of 50-ft. girders and 250 ft. of single-track girder viaduct, the single track beginning at a point called Illinois Junction, and extending continuously to the south end of the bridge. At its south end, the bridge is reached over a long deck-plate girder viaduct in a curve from the south. In this approach structure there is 169 ft. of tangent from the south end of the most southerly through truss, which is followed, in turn, by 100 ft. of 2-deg. 30 min. curve, 1,768 ft. of 4-deg. 45-min. curve, 100 ft. of 2-deg. 30-min. curve, and then by 1,287 ft. of tangent, which extends to the extreme south end of the structure—known as Ballard — a total distance of 3,424 ft.

112-Lb. Rail on Approach

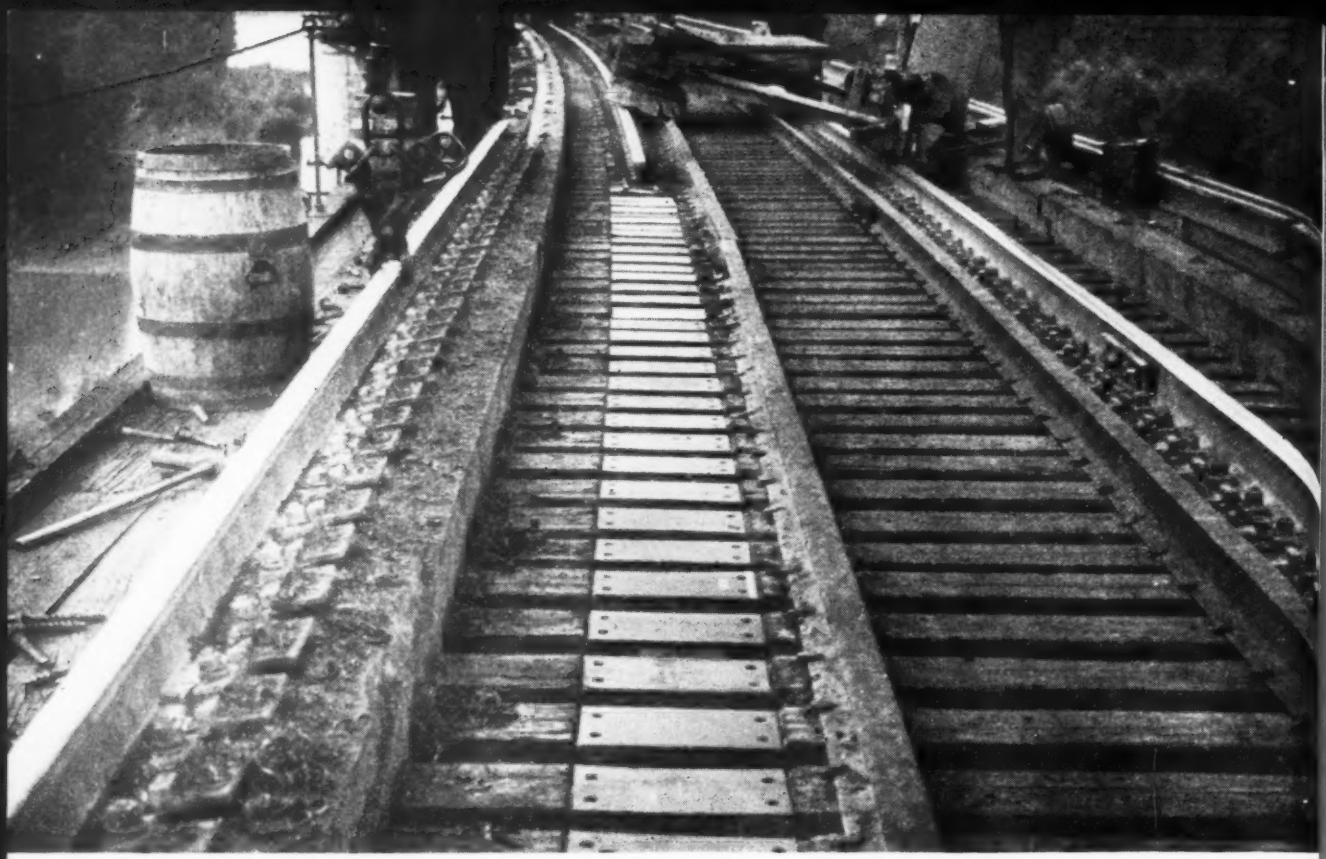
Throughout, the deck girders of the structure are spaced approximately 8 ft. apart and the deck consists of creosoted dense pine ties, 8 in. by 12 in. on the curves and 8 in. by 10 in. on the tangents. In both cases the ties are approximately 10 ft. long, are set on edge, and are dapped over the tops of the supporting girders and secured to them by hook bolts. Both sides of the deck have a timber guard rail, beyond which is a plank walkway, 2 ft. 9 in. wide, in each case protected by a cable handrail.

Continuously over the south approach, the track was laid with 112-lb. RE rail, with GEO-type track fastenings, and throughout the





Left—View of the Viaduct Deck, With the Rail and GEO Plates Removed, Showing the Severely Cut Conditions of the Ties at the Outer Ends of the Plates. Below —Close-Up View of the GEO Construction Used on the South Approach Viaduct, Showing the Severe Plate Cutting at the Outer Ends of the Plates



The Fabreeka Pads in Place on the Newly Adzed Plate Seats, Ready to Receive the Plates and Rail, Shown Assembled at the Left

curved sections it had a superelevation of one inch. Train speeds over the approach and river spans were restricted to 15 m.p.h.

While not a factor in the work done on the south approach, it is of interest to know that this approach was rebuilt in 1935 on a new alinement inside the old alinement, with new piers and heavier girders. It was at that time that the GEO track construction was installed, in conjunction with 112-lb. rail, although all of the rail on the curved part of the viaduct was relaid with new 112-lb. RE rail in February 1942.

¾-In. Wide Gage

The real track problem on the approach was, and had been from the start, the cutting of the GEO tie plates into the ties, with the widened gage that resulted. This cutting was almost entirely at the outer ends of the plates, beneath both the outside and inside rails, and continued, although the tie plates, 8 in. by 14 5/16 in., with 5/64-in. eccentricity, appeared to be adequate in size. Each of these plates was held to the tie by four ⅞-in. lag screws, 6½ in. long, the rail being held to the plates, independent of the ties, by the clips and bolts of the GEO construction.

By February, 1942, the track condition on the approach was a matter of some concern. On the curved section, the head of the high rail was worn approximately 21 per cent, while the head of the low rail was flattened and worn about 15 per cent. Furthermore, cutting of the ties along the outer ends of the tie plates had reached a depth from ½ in. to ¼ in., with a corresponding widening of the track gage through the tilting outward of both rails.

At that time, in an attempt to overcome these conditions, the rail was relaid with new 112-lb. rail, an additional Meco rail lubricator was installed in the high rail directly off the river spans at the upper end of the approach viaduct, and gage rods were installed throughout the approach curve. Combined, these expedients improved conditions, but they did not stop the plate cutting and the tendency toward wide gage, with the result that, by the middle of 1944, the outer ends of the plates had cut into the ties generally as much as ¾ in., producing wide gage of about the same amount.

Use Fabreeka Pads

To correct this condition, consideration was given to removing the rail and plates and relaying the plates on new ¾-in. tapered wood shims. However, in recognition of the fact that shims of this thickness would reduce materially the holding power of the 6½-in. lag screws holding the plates and rail in place, consideration was given to adzing the ties to new level plate seats and to the use of much thinner Fabreeka pads as cushion and wear-resisting shims beneath the plates.

This expedient was decided upon, and pads 8 in. by 14 15/64 in., the same size as the GEO plates, and 15/64 in. thick, were ordered in sufficient number for both rails throughout the 1,968-ft. curved section of the approach. These pads, which are layers of cotton fabric and synthetic rubber vulcanized under high pressure, are oil resistant and highly wear resistant, and are said to have lasting resilience.

Under the plan adopted, it was a matter of removing one or more rails at a time, machine adzing the ties to level plate seats, placing the Fabreeka pads in position, resetting the rail, and redriving the plate-holding screw spikes. In this, the GEO plates were not to be removed from the rails, and all of the work was to be done under traffic.

In carrying out the work, the continuity of which was interfered with seriously by the heavy traffic existing at the time, the installation of the pads was first made downhill on the high rail side, and then uphill on the low rail side, and no more work was undertaken at a time than could be completed between scheduled

train movements. Under this plan, only one or two rails could usually be removed and replaced at a time, although on a few occasions the working intervals were long enough to permit the completion of all operations throughout five rail lengths. To reach even this production, however, it was necessary to thin out the screw spikes holding the rails involved, immediately ahead of the actual work, and to adopt certain other expedients in the interest of securing maximum production during those intervals when the track was unobstructed.

In the actual change-out operations, a Burro rail crane, a Nordberg power adzer, and two Nordberg power nut runners, each equipped with screw spike-driving attachments, were used. When the signal to break track was given, the remaining screw spikes in the rail lengths involved were removed with the nut runners, the joint bars were removed from the joints affected, and then one rail at a time, together with its GEO plates, was lifted out of position by the crane and set outside the near timber guard rail.

Immediately following this the adzing machine leveled off the old plate seats, the Fabreeka pads were set in place, and then the rail was reset and the screw spikes re-applied. If time permitted, the next rail length was treated in the same manner, but, if not, the rail was joined up and the equipment was moved into the clear for traffic. None of the old gage rods was reapplied.

Keep Traffic Moving

To clear for trains the nut runners were set off on the walkways along the track, but the crane, together with the adzer which was set on a push car attached to the crane, was run into the clear at Ballard, at the south end of the approach viaduct. When returning to the job following the passage of a northbound train, the crane and adzer followed up the approach closely behind the train so that work could be resumed as quickly as possible.

In the case of southbound trains over the bridge, care was exercised not to stop them on the north approach grade. To avoid setting the double-single-track junction switch and signal at the north end of the bridge against such trains, the rail crane was run up on pieces of Fabreeka set on the rails upon the approach of a southbound train, thus keeping the track circuit open. This permitted southbound trains to approach the work closely from the north, allowing work operations to proceed while trains were moved slowly over the mile or more of the north approach and river spans. Under this arrangement, even if a train was stopped short of the work, which was done on a few occasions, it was on the level river spans, with a downgrade ahead of it, which presented no operating problem.

Another factor in securing maximum use of the track for carrying out the work was the installation of a temporary telephone at about the mid-point of the south approach, whereby the track forces were kept advised constantly of train arrivals, and could gage their operations accordingly.

Throughout the work, from one to five rails were removed and replaced between trains, with an average of about 12 rails a day. Altogether, the track was cleared up 58 times for traffic, a number that was reduced materially by an attempt to fleet trains past the work to the extent possible. As the high rail was reseated on its new seats, it straightened itself up, correcting the wide gage by one-half, and as the low rail was reseated subsequently the remaining wide gage was overcome completely.

Subsequent Work

Several months following this work, the rail throughout the south approach was relayed in kind, by merely removing the GEO clips, without disturbing the tie plates. At

(Continued on page 72)

Resetting the Lag Screws of the GEO Track Construction, Following the Installation of the Fabreeka Pads

What Lies Ahead

By C. H. MOTTIER,

Vice-President and Chief Engineer,

Illinois Central System, Chicago

THE RAILROADS in general have three great challenges facing them and their future will depend largely on how well they meet them. First, they must continue to advance in the never-ending evolution of the art of transportation, and in all of the activities associated with it. Second, they must sustain and, if possible, expand the sources of traffic which furnish their life-blood, and third, they must master the tremendous challenge which faces them in the field of human relations. When translated into terms of the maintenance problem these challenges mean that we must continue to develop and maintain better railroads; that we must earn sufficient money to improve and maintain them; and that we must master our important human relation problems.

The continued predominance of the American railroads as an agency for handling freight is assured. The competitive situation in the passenger field is much more serious and the future of our passenger business is less secure. If a railroad is to plan wisely for the future, it cannot sit idly by for the next several years to observe the pattern fixed by other railroads or by its competitors employing other forms of transportation, for if nothing is done to hold its passenger business it will soon lose it. The public will demand new and modern streamlined equipment operated at high speeds. We will probably have to operate passenger trains at 100 or more miles per hour, and freight trains at 70 m.p.h. Our competitors for passenger travel will force us to give better service at rates low enough to attract mass travel.

Much that I have said can be condensed into two very significant sentences: First, we will have to operate our trains, both passenger and freight, faster in the future than we have in the past, which will necessitate better track and maintenance standards; and, second, we will have to operate and maintain our properties at a relatively lower cost. Both of these will be necessitated by competition. If we do not operate trains at faster speeds and provide service at a very low cost, we will lose a large part of our passenger business.

Some maintenance men in the ranks may not fully appreciate the importance to them of the financial strength of their railroads. If there is no money in the cash drawer, there is no money with which to maintain the property. All of us should be intensely interested in the traffic and revenues of our companies, as they determine the funds available for our work.

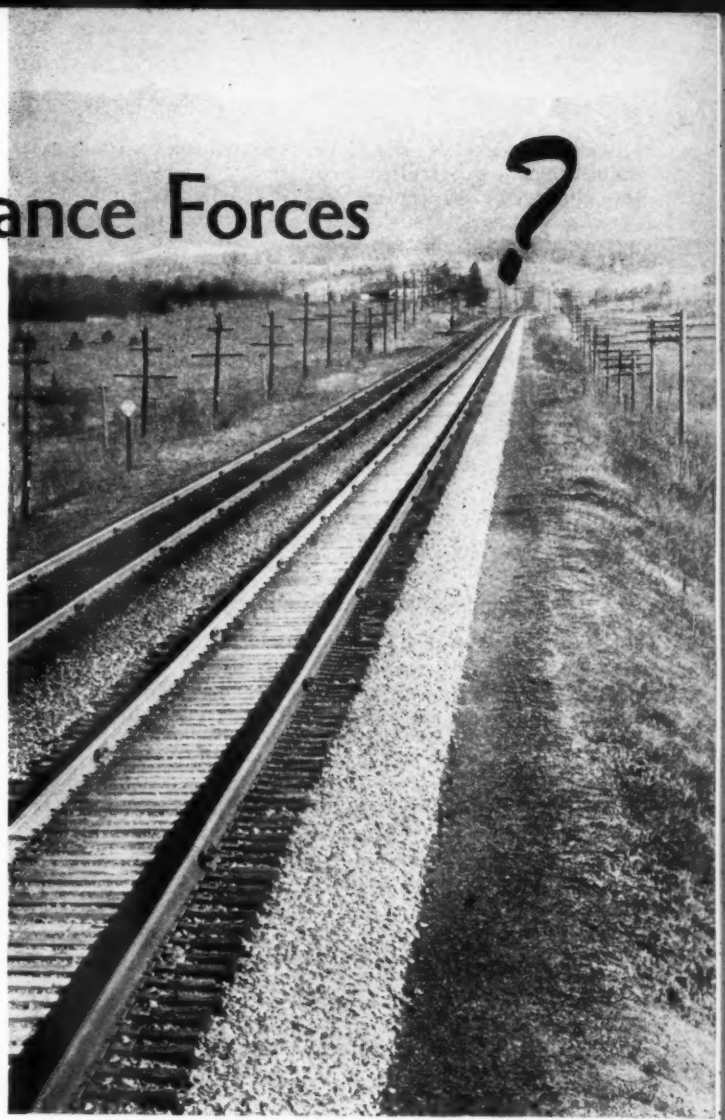
Abstracted from an address presented before a meeting of the Maintenance of Way Club of Chicago on November 26, 1945.

In connection with the inauguration of depreciation accounting on our railroad, effective January 1, 1943, and in conformity with special arrangements made with the Bureau of Internal Revenue, we combed the railroad thoroughly in the three-year period, 1942-44, and retired every facility that was not needed to handle the business. In this program, 3,300 items of fixed property with a value of $13,000,000 were retired. In addition to this special program we also retired seven unprofitable branch lines with a total length of 154 miles. On four of these branches, government requisitioning of rail for war purposes hastened the retirement. These abandonments helped materially to streamline our railroad and will save us much future maintenance.

During this same three-year period we conducted a bridge-filling program. Every timber bridge on the railroad where there was any possibility of reducing the size of the opening was carefully studied and, when possible, was either shortened or replaced with pipe and fill. Through this campaign we have filled 651 timber bridges of an aggregate length of more than ten miles. If we add to these the more than six miles of bridges on the 154 miles of unprofitable branch lines abandoned, it means that we eliminated in this period the expense of maintaining 16½ miles of bridges. The magni-

"We operated so long on low expenditures that some of our people were beginning to believe we could keep it up indefinitely. We all know this philosophy will not work. Now that our fixed property is in better shape we should plan on a uniform maintenance program designed to keep it in good condition and not let it depreciate to its previous run-down condition. We should be governed by the philosophy that 'a stitch in time saves nine.'"

for the Maintenance Forces ?



Mr. Mottier first discusses the situation that is likely to confront the railroads in competing for future business, and then proceeds to interpret this situation in terms of what it will mean to the maintenance man. Along with the need for better tracks to handle high-speed trains will come the necessity of reducing maintenance costs to a minimum, a problem that has two principal components—materials and labor. The latter of these is considered by Mr. Mottier to be the most complex and uncertain factor in the entire situation.

tude of this accomplishment can be appreciated better when it is realized that these 16½ miles of bridges represent one-tenth of the total mileage of bridges on the Illinois Central on January 1, 1942. The saving in maintenance, and the reduction of fire hazards resulting from the bridge-filling program are substantial.

During the depression it was necessary to confine practically all of our expenditures to the track structure. In the last four years we have greatly improved the condition of our bridges, buildings, mechanical facilities, signals, interlocking plants and track structure. We are still deficient in certain materials and facilities which could not be replaced due to war-time restrictions. This is particularly true of rail and coaling stations.

In addition to the foregoing programs we have spent $16,000,000 on fixed property in the last three years, chargeable to capital account, in order adequately to handle the enlarged volume of traffic due to the war. However, in the same period we have retired in excess of $19,000,000 of fixed property, resulting in a net reduction in capital account by approximately $3,000,000.

Future Problems

Let us now take a closer look at our future maintenance problems. We have spoken of the necessity of increasing the speeds of trains. What effect will this have on the maintenance problem?

We will require a better railroad and will have to maintain it better for the higher speeds. One of our problems will be to decide where we are economically justified in developing and maintaining high-speed tracks. We have on the Illinois Central over 3,200 miles of railroad on which passenger service has been abandoned. Under future conditions, there may be additional lines where passenger service will not be profitable. On most of our other mileage, however, passenger service must be continued. On some of our lines where passenger service has been abandoned, as much revenue can be produced by operating freight trains at 25 m.p.h. as at 70 m.p.h. We can economize by spending less on these lines. In the old days we spent almost as much per mile on maintaining branch lines as we did on main lines. The depression has taught us much. We now maintain our property in accordance with the need, the service requirements, and the funds available for such purpose. In the future it will be necessary to consider this relationship even more critically than in the past.

With higher speeds we must have better track to reduce accidents and to add to passenger comfort. Most roads are meeting this problem by devoting attention to every phase of the track structure. They are stabilizing the roadbed, improving the ballast condition, and installing larger ties, larger tie plates, heavier rail, and longer joint bars. On the Illinois Central we have been doing all of these. The proper design of track to carry trains at a given speed, which also requires that consideration be given to curvature, superelevation, spirals, etc., will probably be accorded even more attention in the future than in the past.

How Reduce Costs?

Let us now consider the problem of reducing costs. How can we get more for our money? This question logically resolves itself into two major parts—materials and labor.

Discussing materials first, I believe improvements can still be made in the efficiency and service life of perishable materials, such as the numerous timber products we are now using. Let us think of the one item of ties. A discussion of this item will also illustrate similar possibilities in bridge and building materials. Many substitutes for timber have been developed, but so far as ties are concerned the railroads will probably continue to depend on the timber industry for many years to come. Ties ordinarily fail from decay, mechanical wear or natural defects in the wood. If best results are to be obtained and maintenance costs reduced to a minimum, special attention must be given to the selection, production, treatment and the performance of ties.

If failures from decay are unusually high, the seasoning and treatment methods should be checked; if mechanical wear is excessive, the track structures should be analyzed; and if renewals due to natural defects in the wood are excessive, the tie specifications and inspection should be given special attention. In recent years, more than one-half of the tie renewals on the Illinois Central have been due to mechanical wear. Obviously, as the service life of ties increases, the percentage of failures due to mechanical wear will also increase, but by applying heavier rail, longer joint bars, larger tie plates and better ballast, the service life of ties may be increased, and the annual cost of ties reduced.

In the recent past, there has been a shortage of ties and the railroads have been competing for the available supply and insisting that purchasing agents supply their requirements. Under such conditions, there is always a tendency, by both the producer and the user, to be less insistent in observing tie specifications, which is more likely to result in the production of inferior ties than in increased production.

We feel that the best ties are the most economical, and now that manpower conditions in the tie industry are improving we plan to get back to our pre-war practices as promptly as possible, and to insist on strict adherence to our tie specifications.

There is another general observation I should like to make, which grows out of our experience. We operated so long on low expenditures that some of our people were beginning to believe we could keep it up indefinitely. We all know this philosophy will not work. Now that our fixed property is in better shape we should plan on a uniform maintenance program designed to keep it in good condition and not let it depreciate to its previous run-down condition. We should be governed by the philosophy that a stitch in time saves nine.

"Some improvement can be made in the efficiency and productivity of labor by the use of better tools. Much has been accomplished in recent years by the use of more and better work equipment. On our road we have more than $4,600,000 invested in work equipment. Of this, $2,500,000 is invested in roadway machines, $1,000,000 of which has been invested in the last six years."

The Labor Problem

Let us now consider labor. It is the most important, yet the most complex and uncertain factor we face. How can the productivity of our men be increased? How can our supervision be improved? These are big problems. On our road efficiency has decreased greatly during the war period. I am sure others have suffered similarly. The big problem facing us is: How can our efficiency now be improved?

Some improvement can be made in the efficiency and productivity of labor by the use of better tools. Much has been accomplished in recent years by the use of more and better work equipment. On our road we have more than $4,600,000 invested in work equipment. Of this amount $2,500,000 is invested in roadway machines, $1,000,000 of which has been invested in the last six years. Much has been written on the value of work equipment and special emphasis has recently been placed on off-track equipment.

Has Division Repair Shops

It is not only essential that proper work equipment be provided, but that it be properly maintained, distributed and used. We feel that work equipment, except the large units subject to M.C.B. rules, should be maintained by the maintenance of way department instead of the mechanical department. For this purpose work equipment repair shops are located on each division. We also have a special supervisory organization headed by a superintendent of work equipment, who in turn has two principal assistants, one operating on the Northern Lines and the other on the Southern Lines.

We must get maximum availability and maximum use out of our equipment if it is to pay, and if the expense is to be justified. Careful supervision is required to reach these objectives. A record should be kept of the number of days each major item of equipment is used, as well as of the cost of repair and operation.

Many types of work equipment not only increase the output of work per man, but they also improve the quality of the work done. Good equipment takes the drudgery out

A Roadbed Grouting Organization on the Illinois Central

of track work, so that it becomes easier to keep men on the job. This is an important consideration.

Must Reduce Turnover

We must instill loyalty among our employees. We must give greater attention to the selection of labor and even more to the selection and training of our supervisory force. As far as the Illinois Central is concerned, we have much to accomplish in the way of stabilizing labor. If we reduce labor turnover, we can then lay a foundation for making progress in the training and efficiency of our employees. We have found that our extra gangs are more contented, and have a smaller turnover, if housed in stationary labor camps rather than in camp cars. Recently, ten such camps have been built in, or adjacent to, some of our larger cities.

While our railroad operates in 14 states it is largely a north and south road. I feel we should organize our track extra gangs so that they can be employed the year around, working in the south in the winter and in the north in the summer. It is hoped to provide better camp cars and improved living conditions. We have much at stake in getting the maximum performance out of these gangs. We must train our foremen as well as our supervisors. Immediately someone will say: "How can you do this when you must promote foremen on a seniority basis?" It is a problem, but one that must be solved.

Planning and co-ordination comprise another phase of our work. We have been handicapped in the past few years by not being able to obtain materials when needed. To prevent delays our work must be well planned and the necessary material ordered in advance to permit it to be distributed on schedule. We must concentrate our efforts to a larger extent on what we call "productive work" on the Illinois Central, and must avoid "piddling" around, using up man-hours but getting very little in the way of lasting value for our money.

Most industries are giving more attention to their human problems. So are we. But we must do more. We must create in our men an interest in, and a fondness for, their work, and a desire to give an honest day's work. We should also endeavor to instill in them the thought that what is profitable for the company is also profitable for them.

The easy money of the past four years has developed among some of us a philosophy of plenty which approaches a philosophy of extravagance. We will have to get down to earth and again teach and practice the philosophy of economy. Many of us in executive positions will have to change our views on the spending of money.

"Most industries are giving more attention to their human problems. So are we. But we must do more. We must create in our men an interest in, and a fondness for, their work, and a desire to give an honest day's work. We should also endeavor to instill in them the thought that what is profitable for the company is also profitable for them."

Fewer Fires and Accidents

We must reduce every form of waste, such as fire losses, derailments, accidents of all kinds, and personal injuries. On our railroad, during the war period, we have been concentrating on these items of conservation, and our experience indicates that much can be accomplished. The volume of business handled in the past three years has not varied greatly, so that performances as reported in this three-year period, and given in the accompanying table are on a comparable basis as between the different years.

In September, 1945, we established an unusual record on our railroad. For the first time in the history of the company we went through an entire month without a single reportable injury in the maintenance of way department. In the same month we did not have a single reportable motor car accident. There have been but five months in the last five years, in which no such accident occurred on the Illinois Central.

Fire Losses and Safety Performance

Item	1945	1944	1943
Fire losses sustained	$109,000	$127,000	$173,000
Number of reportable injuries	55	55	101
Casualties per million man-hours	2.85	4.30	5.32
Reportable train accidents due to track defects	16	23	33

How It Was Done

The improvement in our fire loss and safety records has been achieved only through a lot of hard work and conscientious effort directed towards a definite objective. Progress has been made only through the complete co-operation of all concerned. These yardsticks of accomplishments have been mentioned to illustrate what is meant by human problems on a railroad. The improvement in efficiency in all of our work is one of the greatest problems now facing us, and this involves human relations. If the railroads are to survive, the problems involving human relations must receive far more attention in the future than they have in the past. These problems exist within the ranks of management, within the ranks of the employees, and between the railroads and the public.

The railroads face a real test, but they will meet it successfully. They have faced many tests before and are still the backbone of the American transportation system. We cannot, however, rest on our laurels, for competition will be severe and relentless. The principal reason I have confidence in the future of the railroads is because I have confidence in their management and the men and women in the ranks whose future is at stake in the perpetuation of the railroads.

This Poster, No. 268, Constitutes the January Installment of "All the Year—Every Year—Safety Program" of the Safety Section, Association of American Railroads

CANADIAN STATIONS

Set Fast Pace in

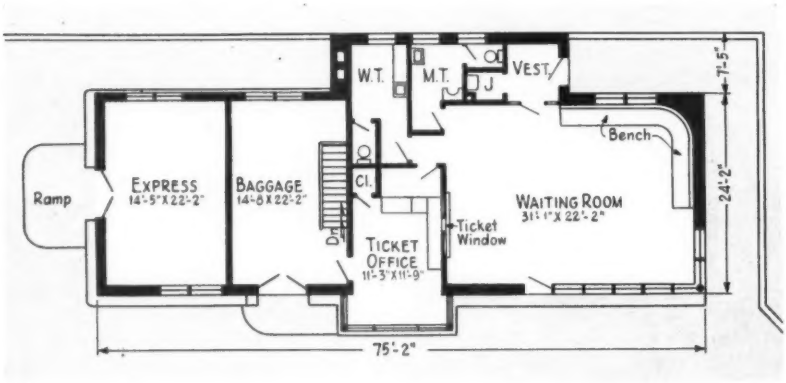
A number of passenger stations now under construction or completed recently on the Canadian National and the Canadian Pacific indicate that a definite trend is under way north of the border toward the use of advanced ideas of design and construction. Representative of these new stations is one on the C.P.R. at Leaside, Ont., and one on the C.N.R. at Midland, Ont., both of which are described in considerable detail in this article.

PASSENGER stations in Canada are going modern. This is evident if one accepts as a criterion of future trends a number of stations in the small or moderately-sized categories that are under construction or have been completed recently by the Canadian National and the Canadian Pacific. Features emphasized in these stations include single-story construction with flat roof lines, functional design and arrangement, broad cantilever-type canopies with horizontal lines, ample window space for visibility and daylight illumination, and the use of modern finishing materials in attractive combinations, while at the same time keeping in mind the need for economy of maintenance and operation.

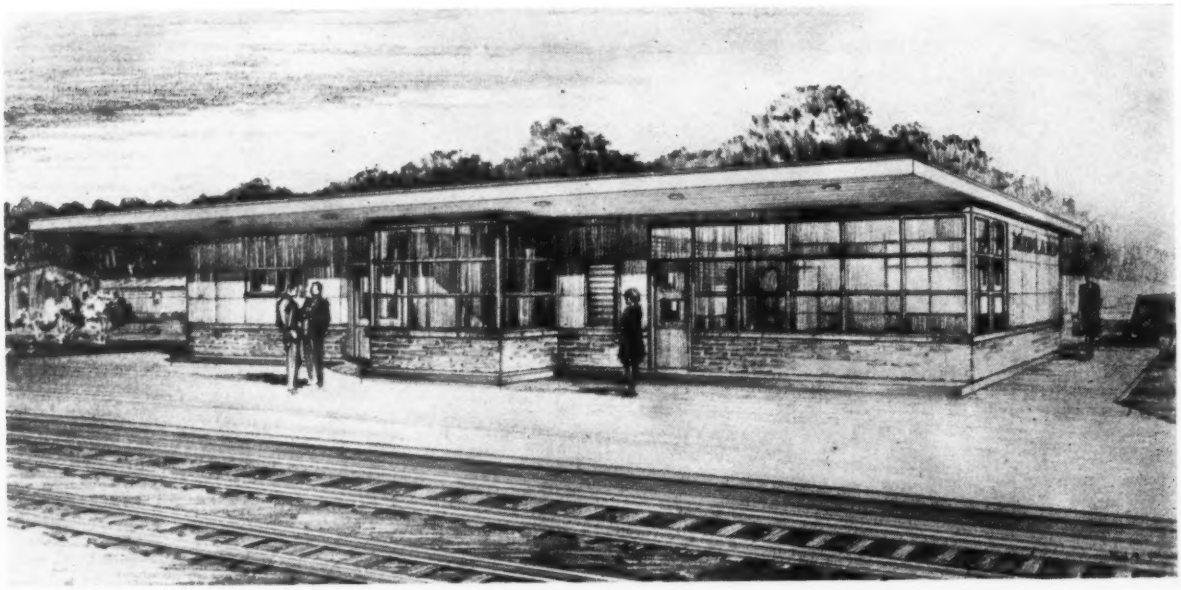
On the Canadian Pacific the present-day trend in station design is reflected in a structure that is now nearing completion at Leaside, Ont., a point near Toronto. Characterized by the railroad as a streamlined type of architecture emphasizing functional design and arrangement, the style embraced in the Leaside station is also to be incorporated in new stations to be constructed at Marathon, Pendleton and Whitefish Falls, all in Ontario, and at Cranbrook, B. C. If these stations prove satisfactory, the design and construction represented in them may be adopted as standard for use throughout the main lines of this road.

Indicative of the prevailing trend in the design of small stations on the Canadian National is one at Midland, Ont., completed recently. That the ideas of design and construction incorporated in this structure are representative of a trend is shown by the fact that similar concepts are being followed in the design of two smaller structures now under construction, one at Ahuntsic, Que., and the other at Pointe aux Trembles, Que.

Since the new stations at Leaside and at Midland are representative of

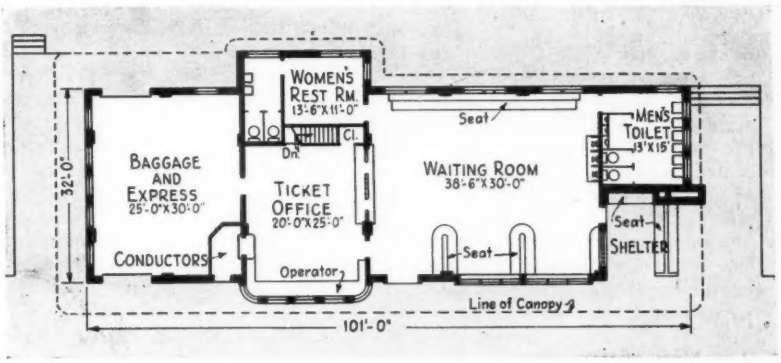


Floor Plan and Architect's Drawing of the Canadian National's New Station at Midland, Ont.



Modern Design

Perspective Drawing and Floor Plan of the Leaside (Ont.) Station of the Canadian Pacific



the present-day trends on the two Canadian roads, these structures are described in some detail in this article to illustrate the nature of their design features, and the character of the construction materials that are being emphasized.

The Leaside Station

Conservatively modernistic in architectural treatment, the Canadian Pacific's new station at Leaside is a one-story structure with basement, and is 32 ft. by 101 ft. in plan, not including a projection on the track side at the location of the ticket office to insure adequate visibility for the operator, and another projection on the rear side at the location of the women's rest room. As shown by the accompanying plan of the station, the interior accommodations consist of a general waiting room, men's and women's toilets, ladies' rest room, ticket office and a room for handling baggage and express.

In exterior appearance the station is characterized by a flat roof with a parapet extending entirely around the structure, except for a wing, which contains a baggage and express room; a broad, cantilever-type canopy, also extending entirely around the building; and an ornamental pylon at one end of which a flagpole is mounted. Structurally, this station features a variety of materials. Primarily it is of reinforced concrete and brick construction, with the floor and roof joists consisting of timber members.

Other Features

Features of the exterior walls include a base course of pick-faced concrete horizontal lines between adjacent windows formed by projecting courses of brick, and a metal coping with a wood core atop the parapet walls. The roof construction embodies a 20-year tar-and-gravel roof over two layers of ½-in. insulation board, a layer of Fibreen paper and ⅞-in. tongue-and-groove sheathing. Further insulation is provided by 3-in. rockwool batts incorporated in the ceiling construction.

The ornamental pylon is constructed of Credit Valley stone. Displayed near the top of the pylon on both the track and rear sides are the letters CPR, nearly three feet high, which are formed of flat metal strips bolted to the stonework. The name "Leaside" is prominently displayed on all four sides of the station by means of wood letters 16 in. high. Enhancing the exterior appearance of the station is a large panel of glass blocks in the end wall adjacent to the pylon. An angle formed here between the pylon and the end wall, protected as it is by the canopy, serves

as an outside shelter and is provided with a back-to-back settee and another settee recessed in the pylon.

Interior Appointments

Features of the main rooms of the station include floors of quarry tile, walls of straight-grained oak paneling, slab doors of white oak, and ceilings of acoustic tile. The toilet rooms have tile walls and floors and are fitted with the latest types of plumbing fixtures. Furnishings in the main waiting room include two back-to-back settees and one wall settee, all constructed of straight-grained oak and having tubular metal supports and runners with chrome finish. Another modern touch is afforded by setting the ticket wickets in a glass block panel. Appointments in the ladies' rest room, including a settee, individual chairs and a writing table with mirror, are designed to harmonize with those in the general waiting room.

The modern appearance of the waiting room is enhanced by the use of fluorescent lighting fixtures. These are mounted on the ceiling and consist of 48-in. units, each having two 40-watt tubes, with glass side panels. These fixtures are arranged in rows of five each, with the rows being placed 10 ft. apart. Other fluorescent lighting includes a 20-watt lamp in a bracket reflector over each wicket at the ticket counter. Heat for the station is supplied by a self-contained hot water heating plant, with concealed radiation in the public rooms.

Because of the type of design and construction used, and the elimination of waste space, the new station at Leaside is expected to show economies in maintenance and operation as compared with less modern designs.

The Midland Station

The Canadian National's new station at Midland, like the one on the C.P.R. at Leaside, is a single-story structure with basement. It is 24 ft. 2 in. by 75 ft. 2 in. in plan, and, in addition, there is a projection on the town side to incorporate the entrance vestibule and the toilets, and another on the track side at the ticket office to insure a clear line of vision in both directions for the operator. As shown on the accompanying plan of this station, its interior accommodations are composed of the main waiting room, toilets for men and women, a ticket office, and separate rooms for handling express and baggage.

General features of the external design of this station include a flat roof, and a broad overhanging canopy on the track side, continuous with the roof line. Since the height of the structure is only 11 ft. 6 in., it has a low trim appearance. The basement and foundation walls and the basement and main floors of the building are constructed of concrete, while the remainder comprises a combination of stone, tile and stucco, with a frame roof covered with 1-in. insulation board and a 15-year bonded felt, pitch-and-gravel roof embodying copper copings and flashings. The under sides of the canopies are finished in Masonite panels and have enclosed glass lighting fixtures.

Exterior Features

On the exterior, a protection curb, 6 in. high and 1 ft. 6 in. wide, is provided along the track side of the station and at the end comprising the baggage and express wing. Extending 2 ft. above the protection curb is a stone base of broken ashlar stone in variegated colors of gray, red and rust, topped by a 6-in. cut stone band course. Above the stone base the walls are finished in stucco of light rust color to harmonize with the stonework, and are divided into panels approximately 2 ft. 6 in. by 4 ft. in size. An exception to the use of stucco is the projection on the town side, which is faced with broken ashlar stone, backed up with terra cotta tile, to the under side of the roof. The walls in the baggage and express rooms are constructed of terra cotta tile covered with stucco on the exterior and backed up with 4-in. brick on the interior.

The generous use of stone on the exterior of this station reflects a desire to maintain an association with predominent local materials as used in old Fort Ste. Marie, which stood less than three miles from the site of the station. In fact, one of the original stones from the old fort, suitably inscribed, was used as the cornerstone of the new station.

Large Window Areas

Especially noteworthy in the midland station are the large areas of sash, reaching from the top of the base course to the under side of the roof, in the ticket office bay and in the wall of the waiting room on the track side. All movable sash are of the casement type and the window frames and sash are constructed of pine with a paint finish. The windows in the waiting room and the ticket office are double glazed.

The main floor of the station consists of a reinforced concrete slab throughout, with that portion in the baggage and express rooms finished monolithic with a metallic hardener. The floor slab in the ticket office also has a monolithic finish to accommodate a linoleum floor covering. In the waiting room and the entrance vestibule the floors are of terrazzo made with red Champlain and Canadian brown marble chips with gray cement and red coloring, and are divided into squares by means of white metal strips. The floors of the toilets are finished in terrazzo with Canadian black marble chips, gray cement and black coloring.

Interior walls in the vestibule, waiting room and ticket office are finished with a Masonite dado 3 ft. 6 in. in height, the dados in the waiting room and vestibule being colored to harmonize with the predominating color in the terrazzo floors. The wall areas above the dados, and the ceilings, are finished in plaster. In the toilets the walls are faced with ceramic tile to a height of 7 ft. 3 in., with plaster finish above, including the ceilings.

The ticket counter is covered with black Masonite with stained birch nosings, and the metal grilles at the ticket windows are separated by panels of translucent glass. Artificial illumination in the waiting room, entrance vestibule and toilets is afforded by enclosed glass fixtures, while the ticket office is lighted by three fluorescent fixtures, each having two lamps.

Except for the toilets and the entrance vestibule, which have enclosed fin-type radiation, the Midland station is heated by means of unit heaters, the one in the waiting room being concealed behind directional-flow grilles.

Other CNR Stations

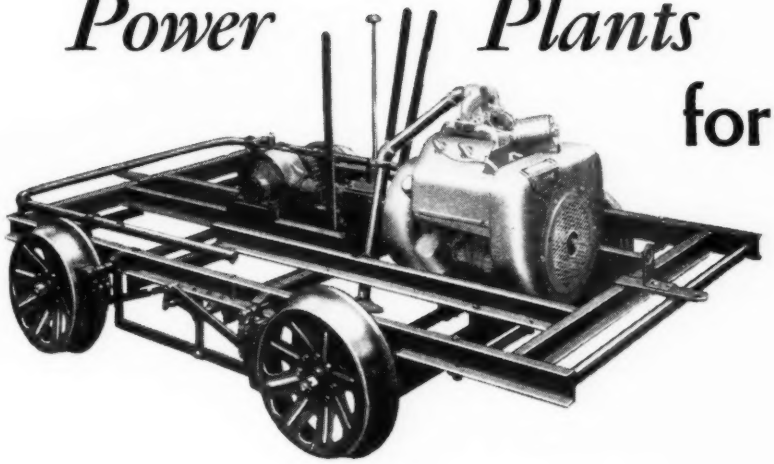
As already indicated, new stations are being built at Ahuntsic and Pointe Aux Trembles, which are similar to that at Midland, except that they are reduced in size in keeping with the municipalities which they serve. Another difference is that the exteriors of the two smaller stations are faced entirely with brick similar to that used in the company's Central station at Montreal, Que., with cut stone trim around the windows and main entrances.

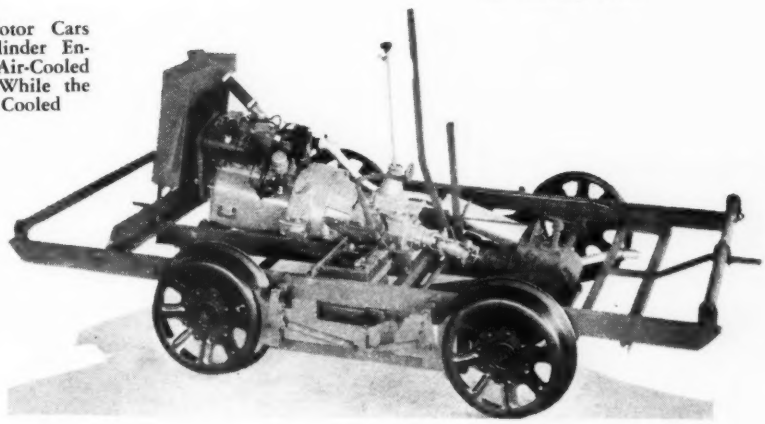
The new stations at Leaside and other points on the Canadian Pacific were designed under the general direction of J. E. Armstrong, chief engineer of the system, and under the direct supervision of N. B. Reardon, engineer of buildings. On the Canadian National, Barton Wheelwright, chief engineer of the system, has general supervision over the design and construction of passenger stations, while J. H. Schofield, chief architect, has direct charge of the design work.

Power Plants for Motor Cars

Part II

By G. R. WESTCOTT
Assistant Engineer
Missouri Pacific Lines
St. Louis, Mo.





Of These Heavy-Duty Motor Cars With Four-Cycle, Four-Cylinder Engines, the One Above Is Air-Cooled With Forced Circulation, While the One Below is Radiator Cooled

No. 6 of a Series

This installment of the series on the selection, care and operation of track motor cars is the second part of a two-part article on motor car power plants. In it the author deals first with cooling systems; then discusses in detail the various types of power transmission employed; and then summarizes in table form the characteristics of the various types of power plants used in the different types of cars. Part I of this installment described the design and operation of two-cycle and four-cycle engines and the fuel system employed.

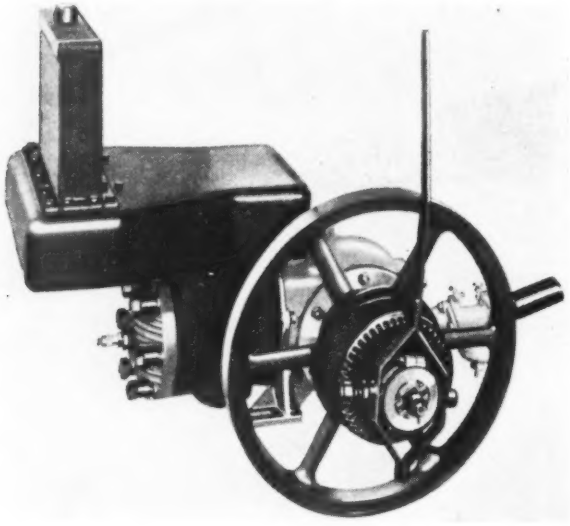
WITH ANY internal combustion engine, good operation demands that a suitable temperature be maintained in the cylinders. If the engine is too cold, the fuel does not ignite and burn freely and the operation is irregular and lacks power. If it is too hot, still more serious loss of power may result due to pre-ignition of the fuel, which is its ignition during the compression stroke by contact with the extremely hot parts of the engine. In addition, high heat may burn the lubricating oil and interfere with the lubrication of the parts. In the compression of the fuel, and still more in its combustion, much heat is developed that must be dissipated in some way. On motor car engines, both air-cooling and water-cooling are used.

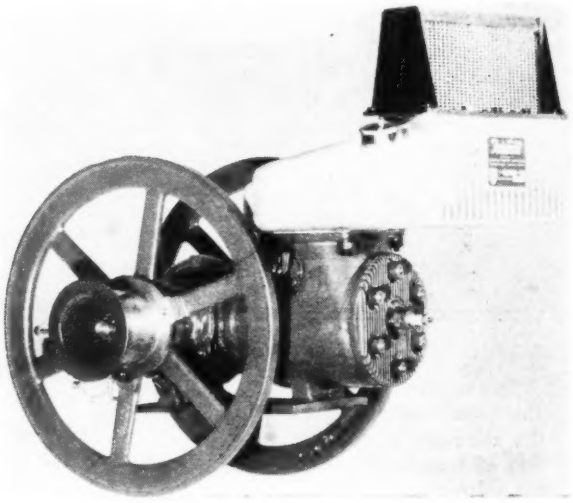
In general, air-cooled engines are lighter in weight than water-cooled units, as the water and its container in the latter units are considerably heavier than the cooling fins cast on the outside of the cylinder and cylinder head of an air-cooled engine. On some cars, this difference in weight has been offset by a system of forced circulation of air about the cylinder and head. In air-cooling, care must be taken, in positioning the engine on the car, that there will be free circulation of air about the cylinder if there is only one; or, if more than one, that all are exposed alike. While many very successful air-cooled motor car engines have been made and are now in service, water cooling is generally more popular where the car is required to make long continuous runs.

The simplest form of water cooling is the hopper type, in which a water hopper surrounds the cylinder and extends above it sufficiently to provide the necessary water capacity. As there is no circulation of the water, the amount required is considerable, and it is likely to boil away rapidly as the engine runs. Except that this requires frequent refilling of the hopper, the boiling of the water is not objectionable, as the two-cycle engine, with which this type of cooling is used, operates best at a rather high temperature.

While there are many hopper-cooled engines in use, and this type of cooling is still furnished on many section duty cars, it has generally given way to condenser cooling on the smaller cars. The latter is a modification of the hopper type, in which the steam that is generated passes to a condenser in which it is cooled, and from which, after condensation, it is led back to the water jacket. By the use of the condenser, the frequent refilling of the hopper is avoided, and, in addition, some advantage in weight is gained as neither the cooling hopper nor the amount of water required is as large as with the old style hopper.

Radiator cooling systems are familiar to all through their universal use on automobiles. They are not used on single-cylinder motor car engines, but are found on some two-cylinder engines and on most engines with four or more cylinders. In radiator cooling, the circulation may be by thermal action only or a water pump may be used. A fan is always provided to increase the circulation of air through the radiator.





Two-Cycle Condenser-Cooled Engines, Showing (Left) a Clutch for Chain Drive and (Below) a Pulley for Belt Drive

Transmitting the Power

In a previous article in this series it was noted that modern motor cars have free-running engines that employ a means of applying the power whereby the engine may run while the car is standing still. There are a number of methods of accomplishing this, some of which are best adapted for use on small cars with single-cylinder engines, while others are used only on the larger cars with multiple-cylinder engines. In discussing the devices commonly used for transmitting the power, it is necessary to consider both the type of the engine and the type of car with which they are to be used.

For section duty and small cars having single-cylinder two-cycle engines, belt drive is used most commonly. The power is transmitted from a pulley on the crank shaft to another pulley on the axle by means of a belt. Originally an idler pulley, controlled by a lever, was used for tightening and slackening the belt. Perhaps because the laced belts then used would not run true, the idler pulley gave way to the sliding base engine. In the latter design, the engine is mounted on a base, along which it may be slid forward or back to tighten or release the belt as required, the movement being controlled by a lever, and the tension on the belt regulated by a spring. The sliding-base engine has been used for many years, and thousands are still in service. It gave excellent service while the base was in good condition, but wear on the base finally permitted the engine to pull out of line under the tension of the belt. The introduction of the endless cord belt brought about a return to the idler belt tightener, which is now the favored method of tightening belts.

Characteristics of the Various Types of Power Plants Used in Track Motor Cars

Type of Car	Type of Engine	Number of Cylinders	Ignition*	Cooling	Transmission
One-Man and Light Inspection	Two-cycle or Four-cycle	1	Dry Cell Battery or Magneto	Condenser or Air	Belt and Idler or Clutch and Chain
		1	Magneto	Air	Bevel Friction or Belt, Reverse Gear and Chain
Light Section	Two-cycle	1	Dry Cell Battery	Condenser	Belt and Idler or Clutch and Chain
	Four-cycle	1	Magneto	Air	Bevel Friction
Section	Two-cycle	1	Dry Cell Battery	Hopper or Condenser	Belt and Idler or Clutch and Chain
	Four-cycle	1	Magneto	Air	Bevel Friction
		2	Magneto	Air or Radiator	Friction Drive
Heavy Duty	Four-cycle	4	Magneto or Wet Cell Battery	Radiator or Air	Selective Gear
Party Inspection	Four-cycle	4 to 8	Wet Cell Battery	Radiator	Selective Gear

*See later article for a discussion of various types of ignition.

Belt and Chain

Another method that is less widely employed combines the use of a belt and a chain, the belt carrying the power to a jack shaft mounted over the drive axle, with chain and sprocket drive from the jack shaft to the axle. The jack shaft mounting permits it to move backward or forward through an arc centered on the axle, and by this movement the belt is tightened or loosened as required. It is claimed for this arrangement that it provides an efficient means of tightening the belt and at the same time protects the belt from

contact with vegetation or snow, which may occur where it runs direct to a pulley on the axle.

These various belt drives provide no choice of speed except by slipping the belt. On a well-designed belt-driven car, some slipping of the belt may be permitted in starting the load, without creating undue wear on the belt, but in order to get added power for handling heavy loads at low speeds, a two-speed transmission may be used. In this latter design, the belt runs from the engine pulley to a jack shaft, on which there is a two-speed mechanism, and either high or low speed power is carried to the axle by means of sprockets and chains. This device is quite popular on some railroads.

Clutch and Chain

Another method of transmitting power on the smaller cars is by the use of a clutch mounted on the engine crank shaft, with a chain running to the drive axle. Although less used than the belt drive, it is very satisfactory where the clutch is of good design and kept in good adjustment. It is to be preferred to belt drive under some conditions, as, for example, where weeds are permitted to grow in the track to a height where they would be drawn between the belt and the pulley and thus lubricate the belt, causing slippage. A somewhat similar condition may be brought about by snow or ice getting between the belt and the pulley. On the other hand, in a country where there is much dirt or sand to contend with, as in the "dust bowl" of the western middle states, the belt is to be preferred because of the abrasive action of the sand on the chain. As with the belt drive, a reasonable amount of clutch slipping is permissible in starting a load.

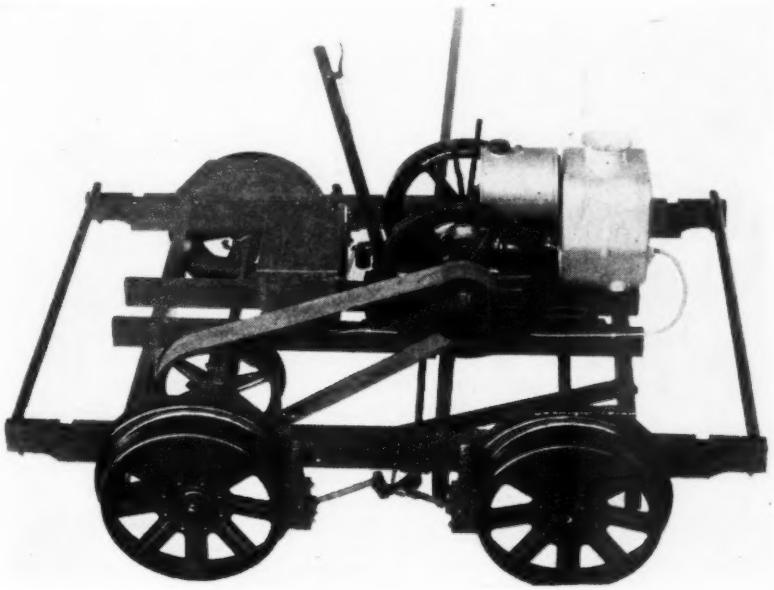
Friction Drive

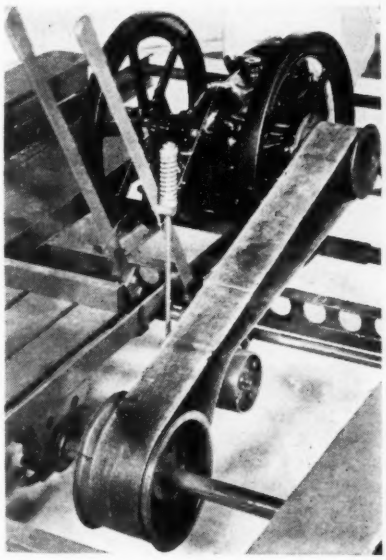
It will be noted that with either clutch and chain or belt and pulley drive, there is no provision for reversing the direction, and such devices are, therefore, adapted for use only with two-cycle engines. Since the four-cycle engine is not reversible, the transmission used with it must include some sort of reversing mechanism. One such device, called the friction drive, has been used on many cars having two-cylinder engines. In it, the rear end of the crank shaft carries a friction disc. A wheel having a fiber rim is mounted on a splined jack shaft at right angles to the crank shaft. Suitable controls permit bringing the fiber rim in contact with the disc at several points at varying distances from its center, thus giving varying speeds; and in either direction from the center of the disc, giving reversal of direction. From the jack shaft, the power is carried to the axle by means of a chain.

With this arrangement, unless all parts are in perfect adjustment, which is sometimes difficult to maintain, and unless care is exercised in handling the car, there is likely to be considerable loss of power, as well as rather high maintenance cost. While there are many cars in use with this type of drive, it is not as popular as it once was. Another system of friction drive, in which beveled friction wheels are employed, is now used on some cars that are powered with single-cylinder, four-cycle engines. Other cars using this type of engine employ a bevel gear reversing box.

Selective Transmission

On the larger cars, the use of a selective transmission similar to that used on an automobile has become common. This usually provides three speeds forward and one in reverse. Sometimes a separate reverse gear is included, thus permitting all speeds in either direction. It may be noted, however, that on some railroads the rules forbid or closely limit the operation of a car backward, in which case the supplementary reverse gear is not required and should not be provided, for its presence will encourage violation of the rules as well as cause unnecessary car maintenance.





Left—A Belt Drive Car With a Siding Base Engine. Above—Belt Drive Car With Idler Control

In some designs, the drive from the transmission gear to the axle is by chain, and in others a propeller shaft is used. The latter is to be preferred, especially if the car is spring mounted, for the movement on the springs will affect the tightness of the chain. In some localities, too, chain life is short on account of sand or dust, and the enclosed propeller shaft is likely to be maintained more easily.

It will be noted that practice in the use of power plants on motor cars varies considerably. The tabulation given herewith is subject to many exceptions but reflects present-day practice in a general way.

When Locomotives Accumulated at the End of Each Shift, as Shown Here, Boiler Water Consumption Was at a Peak

Safeguarding A Terminal Water Supply

The Chicago, Burlington & Quincy, confronted like most other railroads during the war with a tremendous increase in traffic, found it necessary to enlarge its locomotive servicing facilities at many points, which had become overtaxed by increased demands. This article tells how it solved one of these problems, which involved a serious deficiency in the water supply for locomotive use at its Murray Yard in North Kansas City, Mo.

MANY of the enlargement and improvement projects carried out by the railroads of the country during the recent war afford excellent examples of the ingenuity that was applied by the various roads to keep their fixed facilities in step with the huge volume of traffic they were called upon to carry. One of these projects, having to do with water supply, and typical of many others, was carried out on the Chicago, Burlington and Quincy at its Murray yard in North Kansas City, Mo. Here, where the road depended upon its own wells and pumping and treating facilities for water for locomotive use, it became apparent late in 1943 that the water supply was not sufficient to handle the increased train and switching movements due in part to increased demands, and in part to the decreased capacity of the existing wells. Therefore, it was decided to increase the capacity of the water supply at the yard by treating the old wells to restore their original output, by providing a new well, and by enlarging the existing facilities for treating and storing water. However, because of the rapidity with which the enlarged demands came on the road, it was necessary to provide an emergency water supply until the improvements to the company's own facilities could be made. This was done by making a connection to the city water mains, so that city water could be used in case of a breakdown or power failure.

Serving as the terminal for the Burlington's lines from Chicago to Kansas City, Mo., from Kansas City to St. Joseph, Mo., and from St. Louis to Kansas City, and, in addition, as the road's interchange point for the entire Kansas City area, Murray yard constitutes one of the most important terminals on the Burlington system. From December, 1941, locomotive traffic at this point increased steadily, until, in 1943, the number of engines serviced daily reached an average of 55, which

was more than double the average of 23 serviced daily in 1941. Since the latter part of 1943 the demands at the terminal have remained relatively constant. At no other point on the Burlington system has the increase in locomotive service been so pronounced as at Murray yard. The majority of the locomotives serviced at this point are switch engines engaged in interchange work and in serving industrial plants in and around Kansas City, while the remainder include a number of road engines. As the number of locomotives handled increased, boiler water consumption increased, until it reached a peak daily consumption of more than 400,000 gal. in 1943.

Output of Old Wells Reduced

Until 1941 the water supply for Murray yard was obtained from three wells. Two of these, located just north of the enginehouse, were used exclusively to furnish water for locomotive consumption, while the third, located a considerable distance away, near a company-owned grain elevator, was used primarily to furnish water for fire protection. All three wells were sunk in 1922, and were operated by triplex, reciprocating surface-type suction pumps with a maximum lift of 16 to 18 ft. Each of the pumps serving the wells near the enginehouse had a capacity of 300 gal. per min., while the pump serving the well near the grain elevator had a capacity of 100 gal. per min. The water used for locomotive consumption was pumped directly from the wells to a nearby reaction tank, and thence into an adjacent lime-soda treating tank. After treatment in these tanks, which required from 8 to 10 hr., the water was pumped to a 100,000-gal. storage tank located about 800 ft. from the treating tanks.

One Abandoned

By 1941, one of the two wells supplying locomotive boiler water was practically useless and was subsequently abandoned, and the output of the other well had decreased from 300 gal. per min. to about 125 gal. per min. The output of the well used for fire protection had also decreased until it was virtually nil. This drop in the production of the wells was due in part to deposits in the water-bearing formation and on the pump screens, and, in part to the lowering of the water table of the Missouri river, especially during the winter months of December, January and February, months when locomotive water consumption at the terminal is greatest. It was also partly due to the particularly adverse effect of these conditions on the capacity of the type of pump serving these wells.

Confronted with the serious situation of having to maintain an average daily supply of 400,000 gal. of water with one pump, which at its full rated output was capable of producing only about 430,000 gal. per day, and with inadequate treating and storage facilities, it was decided to increase the output of the plant. Accordingly, plans were made for acidizing the one functioning well supplying water for locomotive consumption and the well furnishing water for fire protection to bring them back to full production, to increase the output of the treating plant by replacing the treated water pump with a larger pump and enlarging the riffle box, to increase the clear water storage capacity by erecting an additional water storage tank, and to increase the size of the pipe line connecting the treating plant to the storage tanks. At the same time the water supply itself was to be increased by the addition of a new well.

Putting this plan into effect, the first step was to acidize the one useable well furnishing water for locomotive consumption. This consisted first of placing 10 carboys of 15 per cent inhibited muriatic acid in the well, agitating it thoroughly with air and leaving it for 4 hr. to react with the deposits on the screen and in the water-bearing formation. Then a new 300-gal. per min. Layne vertical turbine pump was installed in the well, and the acid, now diluted with water, was pumped out. Following this, a second solution of acid consisting of 800 gal. of 14-per cent inhibited muriatic acid was placed in the well and left for 5½ hr. All of the acid was then pumped from the well, and, on test, production reached 319 gal. per min. with a 58-ft. draw down. Immediately prior to this last acid treatment, the well produced only about 200 gal. per min. with a 64-ft. draw down. Later, in 1943, this well was acidized again with 800 gal. of 15-per cent stabilized inhibited acid. This treatment resulted in the restoration of its original output.

Enlarge Treating Plant

Continuing with the plan of maintenance and permanent expansion of the water supply, the treating plant was enlarged in 1943 so that its output reached about 550,000 gal. every 24 hr., which was more than enough to satisfy peak consumption. Included in this work was the installation of a new 400-gal. per min. treated water pump, replacing the existing treated water pump which had a maximum capacity of about 270 gal. per min. Following this, the riffle box was enlarged proportionately to handle the increased output.

The Pump at the New Well Is Protected by a New Brick and Concrete Pumphouse

To provide storage capacity for the water required during periods of peak demand, which occurred with the accumulation of locomotives to be serviced at the end of each shift, a 100,000-gal. steel storage tank was erected on a concrete foundation and valve pit, directly alongside the existing 100,000-gal. storage tank. This was a second-hand tank released from use at Pacific Jct., Iowa, because of a rearrangement of the water service facilities at that point. At the same time the 800 ft. of 6-in. pipe line connecting the treating plant to the original storage tank were replaced with 8-in. pipe, and approximately 70 ft. of 12-in. pipe, together with miscellaneous valves and fittings, were also laid.

Sink New Well, Acidize Another

To increase the pumping capacity of the plant, a new well was sunk approximately 400 ft. from the treating plant. As a preliminary to this work, a test hole was drilled to a depth of 133 ft. to ascertain the correct depth for the well. In this, a number of different soil conditions were encountered, but the water-bearing formation consisted essentially of sand with some gravel. After the hole was drilled, it was reamed and a casing having a 13-in. outside diameter was set to a depth of 134 ft. With this in place, a 20-ft. section of 10-in. Keystone-wire-wrapped screen was set in the bottom of the casing and the casing was pulled up to the top of the screen and sealed to it with a lead seal. A Layne vertical turbine pump, with a capacity of 400 gal. per min. and driven by a vertical hollow-shaft motor, was then installed, following which, a new brick pump house was erected over the pump.

The old well near the grain elevator which was used primarily for fire-protection purposes had also, as already pointed out, declined steadily in output until it was considered practically useless. To overcome this situation plans were made for either drilling a new well or for using city water, but on the suggestion of the contractor it was decided to acidize the old well first to see if its production could be increased. Using a treatment involving 150 gal. of 15-per cent acid, the well was restored to near its original output. This accomplished, a new Layne motor-driven vertical-turbine pump having a capacity of 100 gal. per min. was installed, which produced the required water supply without the expense of drilling a new well or using city water.

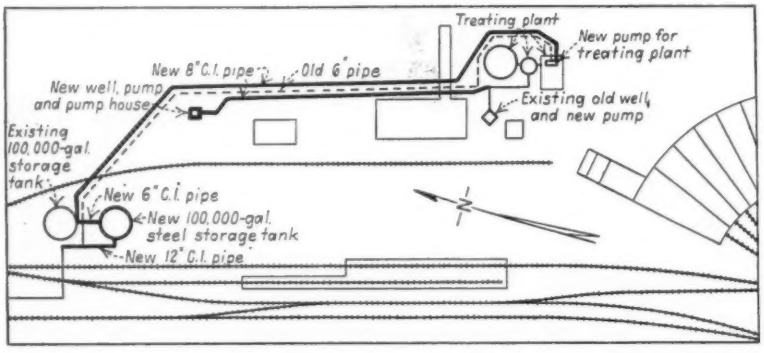
Temporary Water Supply

Until these permanent improvements to the water supply system at Murray yard could be made, it was necessary, to augment the existing supply by other means. This was done by making a connection with the city water mains. This work involved the laying of approximately 1,000 ft. of 6-in. pipe, 770 ft. of 4-in. pipe and 1,000 ft. of 2-in. pipe, together with the necessary water meters, fire hydrants, valves and fittings to meet the city and national health regulations.

Although the city water is treated, it was still necessary to run it through the lime-soda treating plant to make it suitable for locomotive consumption. Also, since a city ordinance would not permit the water to be piped directly through the plant, it was necessary to pipe it over the top of the treating tank and tap it off only as needed. City water was also used for drinking water about the yard, and for servicing troop trains enroute.

Completion of the improvements to the water supply facilities at the yard eliminated any further need for the city supply, but the connection provided was left intact, and the city water has continued to be used for servicing troop trains and for drinking purposes.

All of the work described was carried out under the direction of H. R. Clarke, chief engineer of the Burlington lines, and under the direct supervision of H. G. Dalton, structural engineer, assisted by W. D. Gibson, water service engineer. Layne-Western Company, Kansas City, Mo., was the contractor for all of the work, including the construction of the concrete foundation for the second-hand steel storage tank, with the exception of the installation of the second-hand tank, which was moved and erected by one of the railroad company's system steel tank gangs



Partial Plan of Murray Yard, Showing the Changes Made in the Water Supply Facilities

Cairo Bridge

(Continued from page 59)

the same time, 36-in. angle-bar-type joint bars were applied, the heel flanges of which would not permit the reapplication of the GEO clips directly at the joints. To overcome this situation, the bars involved were sent to the mechanical department shop of the road at Paducah, Ky., and 5/8 in. was planed off the heels of the bars, sufficient to permit their application without interfering with the rail clips.

The results of the work on the south approach have been checked carefully at intervals, and the only precaution followed has been that of keeping the tie plate lag screws turned down tight. At one of the most recent inspections — October 10, 1945—more than 13 months after the work was completed, the track gage around the curve was found to be almost perfect, with the greatest variation at any point 1/8 in. open, and there was no indication anywhere of plate movement or cutting.

Supervision

The work on the south approach was planned and carried out under the general direction of C. H. Mottier, vice-president and chief engineer of the Illinois Central System, C. M. Chumley, engineer maintenance of way, and G. M. O'Rourke, assistant engineer maintenance of way, assisted by C. D. Turley, engineer ties and treatment. The actual work was done under the immediate direction of C. I. Van Arsdalen, division engineer, and A. A. Witter, supervisor of track, both with offices at Carbondale, Ill.

What's the ANSWER?

Maintainers For Rail Lubricators

Should special maintainers be employed to service and maintain rail and flange lubricators? Why? To whom should they report? If not, what method should be employed? What are the advantages?

Depends on Number

By Representative
Railway Supply Company

A special maintainer should be employed to service and maintain railroad lubricators if the number of machines in service on a district is sufficient to justify the cost. This man, devoting his entire time to the work, will become interested in learning the needs of the lubricators and the repairs required to keep them in continuous operation. He will also be in a better position to have the proper tools and certain repair parts available at all times.

The maintainer should report to the roadmaster or track supervisor, keeping him advised through regular reports regarding the inspections of the lubricators and repairs made to them. When the responsibility for maintaining lubricators is placed in the hands of the section forces, it has been found that such forces are frequently unable to make the inspections and repairs when needed because of other duties requiring immediate attention. Furthermore, the prevailing high rate of turnover among section forces has the effect in many instances of leaving the work of maintaining the lubricators in the hands of inexperienced men.

Little Attention Required

By C. H. R. Howe
Cost Engineer, Chesapeake & Ohio, Richmond, Va.

Modern rail and flange lubricators require very little attention in the way of expert mechanical service. Any major replacements or overhauling required can be handled to good advantage by the regular road mechanics, water supply mechanics, or, in some cases, by signal maintainers. Adjustments due to seasonal requirements or the replacement of small parts can readily be handled by the section foreman or the track walker, if properly instructed. Of course, there may be exceptions to these statements. In congested terminal territory or districts of extreme curvature, there might possibly be enough work to make it economical to assign a mechanic exclusively to the lubricators.

The problem of maintaining lubricators economically is not simply one of deciding who is to do the servicing. There are other important considerations that must be taken into account. Generally the process of lubricator installation is progressive. Customarily the first machines are placed at curves where the rail wear is greatest, and then gradually other installations are made until perhaps the entire division, or even system, is protected. When this stage is reached it may be that a check on the situation will show some overlapping of lubricator distribution and that a general scheme of relocation should be undertaken, with a possible reduction in the number of machines.

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered in March

1. *What are the advantages of placing riprap by hand, compared with merely dumping it? The disadvantages? Why? Does the size of the stone make any difference?*
2. *Is it desirable to heat aggregates for concrete in cold weather? Between what temperature limits? How is this done? What precautions should be observed? Should the mixing water be heated also? Why? To what temperature?*
3. *Should section foremen be required to make a detailed inspection of rail for indications of approaching failure on lines over which detector cars are operated? Why? If so, how often and in what detail?*
4. *Preparatory to construction or replacement, what information should be obtained with respect to foundations for piers and abutments? For concrete boxes? Pipe culverts? How should it be obtained?*
5. *What causes a frog to ride hard? What can be done to prevent it?*
6. *When referring to the solids in boiler waters, what is the relation between grains per gallon, pounds per thousand gallons and parts per million?*
7. *Where canted tie plates are in service, can they be continued through turnouts and railway crossings? If so, how is this done? If not, why? Where should the transition from canted to flat plates take place? What are the advantages?*
8. *Is it desirable to provide means for ventilating attics in railway buildings? Why? How should this be done? What precautions are desirable?*

It has been found that the best types of modern lubricators supplied with suitable greases will give effective protection to rail for distances up to five miles. It follows that, by placing a lubricator on each rail, both right and left hand curves will

be covered. If the track is single, the rail is protected for five miles in each direction, so that the need in this case is for one pair of lubricators for each ten miles of track. Where a multiple-track line is involved, the grouping of each set of lubricators at one location will reduce the grease storage capacity required and simplify maintenance.

After a general lubrication policy has been established, it will be natural that some adjustments will be needed to satisfy local conditions, such as, for instance, the shifting of a set of lubricators so that they will be adjacent to and afford protection to the ladder tracks and leads of a major yard. On a road where the rolling stock in operation is predominantly its own equipment, it will be found that the wheel flanges accumulate and distribute a coat of grease to such a degree that the lubrication of curves of three degrees and less may be completely ignored.

What Hammer For Driving Piles?

Is a pile hammer suitable for driving concrete or steel piles also suitable for driving wood piles, and vice versa? Why? Does the length or spacing of the piles or the character of the soil make any difference? In what way?

Little Distinction Here

By Supervisor of Bridges

On my railroad it is the practice to use the same type and weight of hammer for driving both wood and concrete piles, and so far as I know the results have been entirely satisfactory in both cases. The hammer used is a No. 2 Vulcan, which occasionally is supplemented by jetting where unusually difficult driving conditions are encountered. For H-section steel piles it is the practice to use a somewhat heavier hammer, especially where penetrations of considerable depth are required.

Various Factors to Consider

By Assistant Engineer

Whether a pile hammer that is suitable for driving concrete or steel piles is also adaptable for driving wood piles is a question that depends somewhat on the length of the piles and on the conditions under which they are to be driven. Because of their great mass and inertia, concrete piles should be driven with a hammer that is sufficiently heavy and capable of delivering blows of sufficient rapidity to keep the pile in motion between blows. A hammer with such characteristics would probably be satisfactory for driving steel piles, but it might not be suitable for wood piles, particularly if difficult driving conditions are encountered. Under such conditions it is conceivable that the impact of a heavy hammer would do serious damage to a wood pile. Conversely, it is evident that a pile hammer that would be entirely suitable for driving wood piles would be too light to produce good results with either concrete or steel piles.

The spacing of the piles makes a difference in that the compaction of the soil that occurs when piles are closely spaced tends to increase the difficulty of driving them, thereby making it necessary to avoid the use of a hammer that would be sufficiently heavy to damage wood piles. Under such conditions, in fact at any location where the driving is difficult, it may be desirable to use a water jet in conjunction with the hammer to obtain the desired penetration. Another possibility is to pre-bore the holes for the piles with a power auger.

Although concrete piles are not readily damaged when being driven, it may also be desirable, if the going is difficult, to use a water jet with such piles to facilitate penetration. Steel H-section piles can withstand a great deal of hard driving without damage. In any event, many engineers maintain that such piles should not be jetted.

Pile driving specifications generally contain a stipulation to the effect that the piles shall be driven with the heaviest hammer that can be used to secure maximum penetration without damage to the piles. With wood piles, especially if the driving is being done in difficult ground, it is particularly important to avoid the use of a hammer of such weight as to cause the piles to be damaged.

Effects of Higher Speeds

What changes in methods of maintaining track have been necessary by reason of higher train speeds? What has been the effect of increased traffic?

A Matter of Terminology

By Division Engineer

To be strictly accurate the changes in track maintenance that have been required as the result of higher train speeds have not been so much in the methods used as in the degree of attention required and in the standards of maintenance and construction. With certain possible exceptions the methods in use on high-speed districts for lining and surfacing the tracks, for making tie renewals, for laying rail and for performing other maintenance operations, are not essentially different than on lines where prevailing train speeds are somewhat less, assuming that in both instances the gang organizations and the practices in use have kept pace with the advancements, particularly with respect to the use of power equipment, that have characterized maintenance operations in general in recent years.

Of course, it can be said with some truth that the trend to off-track equipment has been due partly to a desire to minimize interference with trains operating on tight schedules, but it is probably more accurate to say that this trend has to a greater degree been influenced by the necessity of permitting maintenance work to be carried on with minimum interference from passing trains. A change in methods that can be attributed more definitely to higher train speeds is the present-day trend toward the elimination of slow orders or the raising of the permissible speeds where the use of slow orders cannot be avoided. With present indications pointing to even tighter train schedules in the future, requiring that high speeds be sustained for long distances without appreciable slowdowns, it can be expected that the maintenance forces will be under greater pressure in the future than ever before to adjust their methods as necessary to minimize the need for slow orders.

If the term "methods" can be interpreted to include standards of maintenance and construction, then it can be said with complete accuracy

that definite changes have been required for higher speeds. To make such speeds possible, with safety and comfort for passengers, it is necessary that the track be maintained to higher standards of line, surface and cross level, not overlooking, of course, the need for curve reduction and of the proper superelevation and spirals for curves. The higher standards of line and surface have been attained partly by strengthening and stabilizing the track structure generally through the use of heavier rail with more efficient fastenings, longer and better ties, higher quality ballast of adequate depth, and various means of restoring the stability of the roadbed, such as grouting, subdrainage systems, driving shoulder poles, etc. Incidentally, these measures have been necessary in part in order to permit the track to withstand the burden imposed by the heavier wheel loads, and heavier traffic generally, to which they have been subjected in recent years.

If the term "methods" can be interpreted to include the amount of attention required by the track structure, then it can also be stated that changes may possibly be required by higher speeds and increased traffic. The more rugged track construction that has come into use on heavy-traffic high-speed lines is designed to keep its line and surface for longer periods and with less attention than tracks built to lighter standards. However, as train speeds go still higher, it is logical to expect that even tracks built to heavy standards will need a certain amount of attention with relative frequency to keep them from developing defects in line and surface that may have the effect of impairing passenger comfort.

No Radical Changes

By H. R. Clarke
Chief Engineer, Burlington Lines, Chicago

No radical changes in methods of maintaining track have been necessary by reason of the somewhat recent increase in train speeds. The speeds of both passenger and freight trains have been increased gradually through the years, and track standards and methods of maintenance have been adjusted as these developments occurred. As a result, when the speeds of passenger trains particularly were substantially increased about ten years ago, it was not necessary to make any drastic changes in either methods or standards. It was largely a question of greater attention to detail, and maintaining the line and surface more accurately and to a standard somewhat higher than was necessary with the lower speeds.

The superelevation of curves, of course, had to be adjusted to the speed at which it was desirable or possible to operate, and spirals were introduced where they were not already in use. The increase in speeds has also emphasized the importance of proper vertical curves, and to some extent the readjustment and lengthening of such curves has been desirable. This work has usually been handled in connection with reballasting operations.

The strength of the track structure has gradually been increased by the greater use of heavier weights of rail, and, in addition, there has probably been some improvement in tie and ballast conditions.

The principal effect of the increased traffic has been to increase the work required to maintain the desired and necessary standards for the speeds at which we are now operating trains, and to emphasize the value of greater strength and ruggedness in the track structure.

Strictly speaking, curve reduction is not a question of maintenance, but the shortening of overall schedules has naturally emphasized the importance of eliminating or reducing curvature which imposes speed restrictions.

Drainage and the Life of Ties

To what extent does drainage affect the life of ties? In what ways?

Poor Drainage Bad For Ties

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Proper drainage of the track means much in securing long life from ties. When water falling on the roadbed, both in the form of rainfall and that coming from engines, is retained by the ballast, thereby being kept in contact with the ties, the ties have a tendency to become wet and soft. One effect of this condition is to promote plate cutting of the ties, which sometimes results in the tie plate sinking so far into the tie as to penetrate beyond the area of treatment, thereby depriving the tie of its protective shell.

Much of the trouble that is caused by poor drainage can be attributed to the fouling of the ballast by dirt, coal, ore and other fine material, which is especially rapid on lines carrying heavy tonnages. Hence, if the proper drainage of the ballast is assured by cleaning it regularly, so that the sides and bottoms of the ties will not constantly be in contact with water, the life of the ties will be correspondingly lengthened. In fact, adequate drainage around the ties means much more to the railroads today, considering the matter from the viewpoint of tie life, than it did when the traffic carried was much lighter and when engine blow-offs were outward rather than downward onto the ties and track generally.

To the extent that the life of ties is affected by poor drainage, the most effective way to secure longer life from ties would be the development of a ballast cleaning machine capable of cleaning the entire ballast section, including material in the cribs, to a point somewhat below the bottoms of the ties. When the ballast is clean and dry the track can be more easily worked and the ties will remain dry and hard, thereby offering better anchorage for the rail, with the result that the track will hold its line and gage longer than if a wet condition prevailed.

In view of the heavy power and the long heavy-tonnage trains that much of our trackage is being required to carry these days, with the resulting heavier punishment inflicted on the ties, it is more important than ever to secure proper drainage of the track as a means of safeguarding the ties.

Moisture Helpful But—

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

If ties have been treated with soluble salts, wet ballast will tend to have a leaching effect, causing the preservative value of the salts to be reduced. However, since moisture has no appreciable leaching effect on the oils that are used for treating ties, the presence of moisture is a help in preventing ties so treated from splitting or checking.

The trouble with wet track is that,

if the ballast is sufficiently wet to keep the ties saturated all the time, there will be enough water present to soak the roadbed and make it unstable. What is gained by keeping the ties moist will be lost through the increased mechanical wear on their surfaces resulting from the constant working of the track. Furthermore, in territories subject to severe winter weather, it is found that saturated crossties, especially if they are made of soft wood, tend to be softened to a considerable degree by being alternately frozen and thawed.

Inasmuch as good drainage is an essential quality of good track, any beneficial effect that wet track can have on the ties should, of course, be disregarded in the interest of the track as a whole.

Most Persistent Enemy

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

Crosstie renewals constitute one of the largest single items of material expense with which the railroads are confronted. Such renewals, therefore, constitute an item that should receive the close attention of the management and of maintenance officers, this being especially true in these days when the costs of labor and materials have shown substantial increases over former years.

Water is the most persistent enemy of crossties. If the ballast is badly fouled, or if it consists of a material that does not afford quick drainage, water accumulating in the ballast section will be held in contact with the ties and cause the fibers of the wood to become softened, a fact which applies to treated as well as untreated ties. When this occurs the ties do not hold the spikes as securely as they would if dry, making it necessary to renew the ties at an earlier date than would be required if the ballast section was such as to afford adequate drainage. It has been my experience that the lack of proper drainage in the ballast section is one of the most important factors in shortening the life of ties. The cleaner the ballast and the better the drainage of the roadbed, the longer will be the life that will be secured from the ties.

What Level For Station Floors

Should the floor of a passenger station be flush with the platform or raised above it? Why? If the latter, how much? What are the considerations?

Floors Should Be Higher

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

It is general practice on most railroads to raise the floors of passenger stations about six or seven inches above the platforms. However, the difference in elevation should be no greater than this for there is always a hazard involved for patrons if it is necessary to use steps when entering or leaving stations.

The raising of the floor of a station above the level of the platform is necessary to obviate the possibility of water gaining access to the waiting and other rooms. It is our practice to construct platforms so that the water will drain away from the station. The purpose is to keep water from standing under and around the foundation of the building, and also to eliminate the possibility of passengers encountering a bad condition when boarding and leaving trains. In some instances, lack of proper drainage has required us to provide gutters for disposing of water flowing from the roofs of stations in order to prevent it from accumulating on the tracks.

At large stations and at small shelter sheds having projecting roofs, it is our policy, if practical, to avoid the necessity of providing steps at the waiting room entrance.

Several Factors Involved

By H. C. Lorenz
Assistant Engineer, New York Central, Cincinnati, Ohio

Generally speaking, where the elevation of the track is permanently established, it is my opinion that the floor of the station should be at the platform level, in the interest of convenience for passengers and of facilitating the handling of baggage, mail and express. It may be desirable to elevate the floor of the station under some circumstances, such as: (1) Where a wood frame floor is used; (2) where the topography is such that a flash rain may cause the floor to be inundated; and (3) where it is desirable to provide for a possible future ballast lift.

In other words, the considerations, as I see them, are the convenience of patrons, facility in handling baggage, mail and express, the type of floor construction, the possibilities of a future ballast lift, and the topography in the vicinity of the station, with particular regard to the elevation of highways approaching it.

Horizontal Plane Desirable

By W. A. Meissner
Assistant Engineer, Lehigh Valley, Wilkes-Barre, Pa.

In the interest of a rapid and economical flow of business, both passenger and freight, at railroad stations, it is essential, insofar as possible, that the facilities be arranged in a horizontal plane. Any serious deviation from such a plane causes a slowing up of the flow of business, resulting in delays and increased operating costs.

At passenger stations where there is any considerable amount of business to be handled the floor should be raised only high enough above the station platform to keep water from entering the station, avoiding, if possible, a difference in elevation that would require steep ramps or steps. Passengers can then move readily between the station and the platform without delay or interruption. Also, where mail, baggage and express are carried in hand trucks, this equipment can be easily moved from train side to the shelter of the station building with a minimum of effort. Ease and rapidity in handling such business are especially desirable during the winter months when the volume is heavy and trains must be worked in bad weather.

At locations where there is a considerable amount of passenger traffic to be handled, every effort should be made to avoid the need for placing steps or stairways between the stations and the platforms. Steps are not only a potential hazard to safety, but they also act to retard the movement of passengers to and from the station. The location of the floor of a station on a level higher than that of the station platform, requiring the use of steps, inclines, or the installation of elevators, is to be avoided wherever possible. Where it is necessary to convey passengers by means of elevators, the flow of traffic becomes seriously retarded as well as costly. Likewise, the cost of handling baggage and mail is increased.

Any design for a passenger station

should give primary consideration to the free flow of passengers and goods, and the layout should be so designed as to permit both to be handled expeditiously and at the lowest possible cost.

Depends on Circumstances

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

Drainage and snow conditions are largely the determining factors in establishing the height of passenger station floors with respect to the track. Due consideration to these factors leads us to the conclusion that it is best to establish the passenger station floor at platform height at locations where the elevation of the track or tracks is fixed, providing that drainage can be properly handled if this is done. Allowing water to run off the platforms into the track area makes for sloppy tracks at a location where they should be at their best.

In open country where overhead clearances are not a factor, it can be reasonably expected that the track will be raised as much as a foot or more during the life of a passenger station. At such locations, the floors of passenger stations should be established sufficiently high to prevent platform water from entering the station in the event the tracks are raised, even if this involves the need for installing several steps to permit the station to be reached from the platform level.

Gangs For Renewing Turnouts

What advantages, if any, are there in organizing special gangs for renewing turnouts, including slip switches, in large yards and busy terminals? What disadvantages?

Have Definite Advantages

By R. G. Simmons
General Track Inspector, Chicago, Milwaukee, St. Paul & Pacific, Chicago

There are advantages in organizing special gangs for renewing turnouts in busy terminals, mainly because this type of work must frequently be done altogether or partially under traffic or during specified periods of the day. In other words, if heavy turnout renewals are to be made in a terminal, careful consideration should be given the matter of organizing a special gang for doing the work. Where the use of such a gang is contemplated it is possible to program the work well ahead of time giving due consideration to the situation with respect to the operation of trains over the trackage that is to be renewed. It is frequently necessary in busy terminals to rearrange the working hours every few days because of changes in operating conditions, and this is usually done best where a special gang is being used.

The type and number of turnouts to be renewed govern the size of the gang that is to be organized. When the gang has worked a few days it becomes sufficiently experienced so that the amount of lost time has usually been reduced to a minimum. Good results can be realized by having the same organization on the work day after day, to the end that every move is made to count in the time that is available. This is especially true where the work involved must be done under traffic and the time allotted is very limited.

At most locations it is usually necessary to do considerable preparatory work before the actual installation work is attempted. This is always accomplished to much better advantage if it is planned and executed by a special switch gang rather than by the regular forces which are always subject to interruptions caused by the emergencies that arise from time to time in any busy terminal.

Not General Practice

By S. E. Armstrong
Engineer Maintenance of Way—System, New York Central System, New York

It is not our general practice to organize special gangs for renewing turnouts in our large yards and busy terminals, the reason being that our organization is so arranged that we have well-trained and experienced gangs that are readily available for this particular type of work. The men in these gangs are thoroughly familiar with the local conditions, not only the maintenance requirements, but also the situation from an operating viewpoint. If the project should require additional forces, these are recruited from adjacent sections. By this means we feel that we get a much higher standard of work, in addition to saving considerable man-power and time.

Has Every Advantage

By J. C. Rouse
Extra Gang Foreman, Western Division, Southern Pacific

In a large yard or terminal a specially organized gang, equipped with portable compressors, pneumatic or other power drills, spiking hammers, power wrenches, cutting torches and other tools, can work to every advantage in renewing turnouts. Where there are several foremen available, there is always one who is more capable than the others in renewing switches or in performing other work of a complicated nature. Likewise, not all laborers will be capable of handling expensive equipment to the best advantage.

It would appear, therefore, that the best policy is to have switch work, and kindred operations, performed by a capable foreman in charge of a gang of selected men, in which two or more of the men are trained to handle each piece of equipment or to perform each operation. The speed and efficiency with which a trained gang of this type can work in a busy yard under traffic can readily be appreciated. A capable foreman doing this type of work regularly becomes very efficient in using materials to the best advantage. The amount of waste that can be avoided in this manner is apparent when it is realized that a mistake resulting in the reduction of one good rail to scrap amounts to a considerable loss.

There are no disadvantages worth considering in the use of a special gang for renewing turnouts. When there is no work of this type to be done, the gang that is specially trained and equipped for it can be used conveniently in regular yard maintenance work. During such times an opportunity is presented for the mechanics to inspect the equipment used by the gangs and to make necessary repairs.

Does Not Use Such Gangs

By C. G. Grove
Chief Engineer Maintenance of Way, Pennsylvania, Chicago

We have never organized gangs for the special purpose of renewing turnouts and slip switches in large yards or busy terminals. On every

supervisor's subdivision there is usually at least one foreman who is especially adept in switch work and who has several experienced men in his gang who are familiar with the material and know where and how the various items are to be installed.

To such gangs is assigned the work of installing new switches or of renewing existing switches. If the work is extensive, involving a group of switches, or is to be carried out at a very busy location, a general foreman is assigned to assist in laying out and supervising the work. In such cases the supervisor also gives his close personal attention to the project.

We have found it advantageous in some locations, where traffic is extremely heavy and where no vacant space adjacent to the point of installation is available, to assemble slip switches completely at some distance from the point of installation. In such cases the rail is fully spiked to the ties and the switch movements are applied and tested. The rails are then marked to show their location, and the positions of the various ties are indicated by numbering them. The slip is then taken apart and moved in pieces to the point of installation, with the tie plates, switch plates and the switch movements being left in position on the ties. This practice assures correct fit and working adjustment of the switch immediately upon installation and results in less time being required for the use of the track. There is a further advantage in this practice in that the men become familiar with the location and method of application of the various parts, a fact which results in a saving of time in the final installation.

Due primarily to the fact that we do not have a sufficiently sustained volume of such work in any territory, we do not consider it advantageous to organize special gangs for renewing switches in yards and terminals.

Experienced Men Required

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Since there are locations on some railroads where forces are kept at work continuously in renewing turnouts, it is conceivable that under certain conditions the use of special gangs for such work would have advantages as compared with gangs built up by drawing personnel from other yards or outlying points.

The men selected for such special gangs should, of course, include only the best laborers, experienced in working in terminals and yards, who know how to work safely under such conditions, and how to handle heavy items of track material. They should also be able to respond to the instructions of the foreman quickly, and should be familiar with the use of the various tools required in turnout work.

At smaller yards, or at points on the line, a foreman should be available, with a force of men, who can take charge of switch renewal work. At every location there is a foreman who is better qualified than others to handle such work. Where switches are being replaced with rails of the same weight, the work can be done piece-meal to keep trains moving, or at least without taking the track out of service for any great length of time, using the intervals between trains to prepare the parts needed. When installing the switches the force doing the work should have all the time that can possibly be had, for the reason that if the time is too limited it is not always possible to do the best job in lining and spiking the rail, with the result that it might be necessary to do the work over again.

Good line is more important at turnouts, in the interest of long life for the rails, frogs, switch points and ties, than for any other part of the track structure. Also, it is important that renewal work be done in such a manner as to minimize interruptions to train movements. For these reasons it pays to have a gang of men available for doing such work, who know how to do the job as it should be done.

Roofs for Water Tanks

What are the advantages of roofs on water tanks? The disadvantages?

Sees No Disadvantages

By E. M. Grime
Engineer Water Service, Northern Pacific, St. Paul, Minn.

Probably among the most important advantages of having a roof on a water tank are those of discouraging the growth of algae on the surface of the water in the summer season and of providing a certain amount of insulation during the winter season that tends to prevent the formation of an excessive thickness of ice. In addition, the roof serves to keep the water in cleaner condition by excluding dust, leaves and any other debris that might be carried in the air, and also prevents birds from building nests on the bracing or other parts. A roof, moreover, acts as a form of bracing to hold the tank in shape and to provide support for the tank valve operating lever and the target float, which are best maintained some distance in from the sides of the tank.

At places where water is used for drinking purposes it is not possible to maintain the supply in a completely sanitary condition without the protection of a roof on the storage tank, and even where the water is used only for locomotive boilers it is desirable to keep it free from debris of any kind. In a number of instances I have seen open tanks, fed from an ample gravity supply, in which the continual wasting of the water from the upper surface had the effect of preventing the water from becoming polluted by materials lodging on it, due to the fact that such materials were quickly floated off. This condition, however, is seldom found.

Aside from the additional cost of constructing and maintaining roofs for water tanks, which is not great, I see no disadvantages in such roofs. They do exclude one to several feet of good moisture which may fall from the heavens each year, but this is infinitesimal as far as the total water supply is concerned.

Many Considerations

By C. R. Knowles
Superintendent Water Service (Retired), Illinois Central, Chicago

There is considerable difference of opinion regarding the question as to whether roofs on water tanks are desirable or necessary. These opinions are largely influenced by the geographical locations of the tanks and the use made of the water. Other considerations are sometimes overlooked or are considered of minor importance. It is generally admitted that tanks located in the colder climates where the water is subjected to freezing temperatures should be provided with roofs as a protection against frost. In fact, in some cases

a double roof is constructed to provide a dead air space as further protection against freezing. Where the water is used for domestic purposes a roof is necessary to protect it from pollution. Many state laws require that tanks be roofed where the water is used for human consumption.

A well-designed roof adds to the appearance of a tank. It also affords protection for the tops of the staves of wooden tanks, which are subject to rapid decay where they are alternately wet and dry as the level of the water in the tank rises and falls. In addition, a roof prevents birds and animals from gaining access to the tank.

There are no disadvantages or objections to roofs on water tanks other than the cost, which is outweighed by the advantages. If the roof is to serve its purpose it must be maintained in good condition at all times. In cold climates the space between the roof and the staves should be sealed as a measure of protection against frost. Where ventilation is required it may be provided at the pinnacle of the roof. In warm climates ventilation may be secured by placing a wire mesh screen between the roof and the tops of the staves to keep birds and animals out of the tank.

The rafters and sheathing of the roofs of wood tanks should be kept in good condition to avoid the possibility of workmen falling through them, and of preventing pieces of wood from dropping into the water. Hatch covers should be tight and should be constructed of comparatively light materials so that they can be handled by one man. They should be secured in such a manner that there will be no danger of their falling or being blown from the roof. Roofs of steel tanks should be kept well painted, particularly on the under side, to prevent corrosion.

Can Dispense With Them

By L. G. Byrd

Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

In the early days of the railroads, especially in the South, it was a standard practice to construct waterproof roofs on both steel and wood water tanks. In recent years, when the roofs had deteriorated to the point where heavy repairs were required, or renewal was necessary, we found that the roofs not only served no good purpose but were a disadvantage as well as a fire hazard on wood tanks. This applies to a particular degree in the southern states where roofs on tanks are not required as a means of frostproofing them. A roof on a wood tank causes a variation in the temperature in the tank, and if the tank is not kept full of water at all times the staves will decay for a distance of 18 in. to 2 ft. below the top, while the balance remains in good condition.

We have found it necessary to remove roofs from steel tanks for the reason that, when they become corroded, scale and other material are likely to fall from them and to lodge under the valves. Also, delays to trains have been caused by the scale interfering with the injectors.

Tanks should be kept thoroughly clean at all times to afford the best and cleanest water for locomotives. Where it is necessary to maintain roofs on wood tanks as a protection against freezing, to keep out birds, and to prevent particles of material from falling into the water, they should be constructed of Wolmanized material. The roofs of steel tanks should be kept thoroughly clean and painted at all times to eliminate the possibility of corrosion.

Heat Protection For Concrete

What effective method can be employed to protect the concrete in cinder pits against damage from heat?

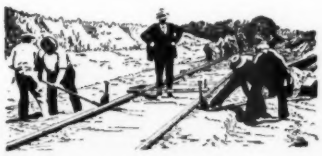
Various Measures

By Assistant Engineer

Several methods are in use for protecting the concrete in cinder pits from damage by heat. On some railroads the means of protection afforded is in the form of vitrified brick linings, although it is realized that such linings are subject to injury by the buckets used to remove the cinders and, therefore, offer difficulties in maintenance. On other roads it is specified that the concrete in cinder pits shall be made with sulphate-resistant cement and that the coarse aggregate shall consist of gravel or slag, as against limestone which tends to break down in the presence of heat.

My opinion is that the damage noticeable in concrete cinder pits is due to a combination of heat and chemical action, the latter of which is, of course, enhanced by the presence of heat. This being the case, it would seem to be sufficient, as a means of protecting the concrete, to make it with the sulphate-resistant cement and to exclude aggregates that are likely to be damaged by heat. The concrete cinder pits that have been constructed recently on the railroad with which I am connected have been afforded no other protective means than these, and they seem to be giving satisfactory results.

Recent experience indicates that the deterioration of concrete cinder pits seems to take place more rapidly at the tops of the pit walls than elsewhere, but this is due more to the pounding action of traffic and other factors than it is to the presence of heat. To protect the pit walls from deterioration at these points it would seem that closer attention to design would be indicated, along with the provision of some sort of protective covering, such as cast iron plates.



Mentions Two Methods

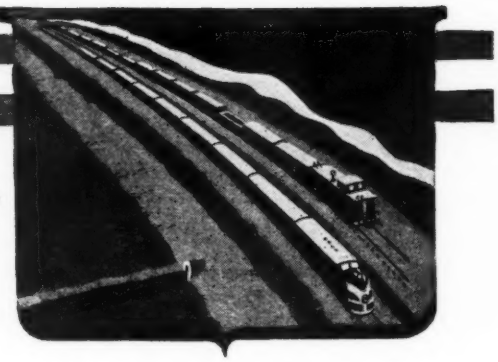
By G. S. Crites

Division Engineer, Baltimore & Ohio, Baltimore, Md.

There are two possible ways of preventing heat damage to concrete. The concrete can either be insulated with refractory brick or sheets, or sufficient heat-absorbing metal can be imbedded in the concrete to prevent sudden changes in temperature in the concrete mass. If the latter method is used, the imbedded metal must have the same coefficient of expansion as the concrete.

When using refractory coatings, they should be applied with refractory cement, and if they can be made gas and moisture-proof the concrete can be further protected by heavy reinforcing rather close to its surface on the protected side. If there is any doubt as to the moisture-resisting qualities of the refractory coating, the reinforcing in the concrete should be placed to a sufficient depth to keep corrosive agents away from it. The closer the heavy reinforcing is to the refractory coating the better it will absorb heat, but little would be gained for any length of time if the reinforcing should be subject to corrosion from exposure.

NEWS of the Month



Ten Months' Net Was $474,000,000

The Class I railroads in the first 10 months of 1945 had an estimated net income, after interest and rentals, of $474,000,000, compared with $562,837,263 in the corresponding period of 1944, according to the Bureau of Railway Economics of the Association of American Railroads. October's estimated net income was $21,000,000, compared with $59,821,849 in October, 1944. Operating revenues for October totaled $696,991,354, against $818,302,899 in October, 1944, while 10 months' gross revenues were $7,627,386,401 in 1945, compared with $7,898,825,073 in the same period of 1944.

Barnard Heads I.C.C.

George M. Barnard, Republican of Indiana, and a member of the Interstate Commerce Commission since November 29, 1944, has been elected chairman of that body for the year 1946, succeeding John L. Rogers, whose term expired on January 1. Ordinarily the chairmanship of the commission is filled for a one-year period in order of seniority. However, Commissioner J. Monroe Johnson, who was next in line for the position, stated that his duties as director of the Office of Defense Transportation were such as to preclude his taking on the additional work attached to the chairmanship.

Mexican Railway Workers Being Returned Home Rapidly

There has been a marked decrease since V-J day in the number of Mexican Nationals at work on United States railways, due to the non-renewal of expiring contracts between the Mexican government and the railroads. On August 20, the War Manpower Commission announced that recruitment of Mexican labor for railway employment in the United States was at an end and that from that date on no expiring contracts could be renewed. As a result of that action it was expected that all of the Mexicans would be returned to their homeland by February 28. However, due to transportation difficulties on the Mexican railways, it now appears that some of these men will not be returned to Mexico until the last of March.

The employment of the Mexicans has been of great assistance to the railroads in meeting the war-time shortage of man-power, especially in the maintenance of way department. Starting modestly with about 13,000 men in August, 1943, the number of Mexicans at work on U.S. roads increased steadily throughout that year, 1944, and the first half of 1945, and reached a peak of more than 68,000 men in August of the latter year. Since that time the number in railway employment in this country has declined steadily and on December 22, it was approximately 35,000 men.

Land-Grant Rates Repealed

President Truman, on December 12, signed the recently-enacted Boren bill which repeals remaining provisions of the land-grant-rate law, effective October 1, 1946. Passage of this bill means that after that date, shipments of troops and of certain supplies for the Army and Navy will not be subject to deductions from the rates assessed ordinary shippers and travellers when routed via certain land-grant railroads, mainly in the West. Although the land-grant rates applied only to specified roads, other lines, in order to secure a share in the vast volume of government traffic, agreed to lower their rates to those required of the land-grant lines, so that, in effect, the government was granted rate concessions on virtually all western lines.

Man-power Shortage 40,000 Under Year Ago

Unfilled openings for employment on United States railroads totaled 50,262 as of November 30, 1945, compared with 90,949 on the same date in 1944, according to a report of the United States Railroad Retirement Board as this issue goes to press. Included in the total of 50,262 vacancies on record at the end of November were positions for 12,401 sectionmen, 10,696 extra-gang laborers, and 1,128 bridge and building carpenters.

Analysis of the reports issued by the Board reveals that the largest number of unfilled openings in 1945 occurred in May, when vacancies totaled 100,888. Since that time there has been a steady decline in the number of vacant positions in all departments, except for a small increase in the shortage of track-men at the end of September, caused by the return of large numbers of Mexican track laborers to their homeland.

Heavy Travel Causes Congestion

Heavy civilian travel, plus an unprecedented flow of returning service men from West Coast ports, caused considerable congestion in railway passenger service through the Christmas holidays. At Chicago, St. Louis and other important East-West interchange points, thousands of passengers were stranded, unable to get on departing trains.

The congestion was due largely to heavy movements of homeward bound troops, who now have the exclusive use of 75 per cent of all sleeping car beds and of more than one-third of all day coaches. On the Pacific coast more than 115,000 service men arrived in the three-day period December 17, 18 and 19, with the result that many were stranded in that area over Christmas. Commencing about December 20, there was a marked reduction (temporary only) in arrivals at Pacific Coast cities so that by New Year's Day, the average time lag between arrival by water and departure in eastward trains had been reduced to about 12 hr.

According to statements of the armed forces and the Office of Defense Transportation, the movement of men from the Pacific Theater will continue unabated until May or June.

Roads to Buy Pullman Sleeping Cars

Proclaiming the railroads to be the "natural and obvious people to do sleeping car business," the special three-judge Federal expediting court, which began hearings November 5 to determine which of four bidding groups should be permitted to purchase the $75 million Pullman sleeping car services, on December 18, filed its opinion approving sale to the upwards of 50 railroads seeking sanction of the court to consummate a tentative contract with Pullman, Inc.

New Toledo Station For New York Central

The New York Central has announced plans for the early construction of a new through-type passenger station at Toledo, Ohio. The main station will consist of a three-story building, with a concourse extending over nine station tracks, which will serve also as the main waiting room. It will be flanked on opposite ends by separate mail and express buildings.

The new station will be built on the approximate site of the present one and will make use of some of the present platforms, which, however, will be widened. There will be no change in present locomotive and train servicing facilities other than those occasioned by the shifting of tracks. The New York Central station at Toledo is used by the Baltimore & Ohio, Chesapeake & Ohio, Pere Marquette and Wabash.

Changes in Railway Personnel

General

C. C. Madison, assistant division engineer on the Chesapeake & Ohio, at Russell, Ky., has been promoted to assistant trainmaster, at Logan, Ohio.

C. L. Persons, assistant to the executive vice-president of the Chicago, Burlington & Quincy, at Chicago, and an engineer by training and experience, has retired after forty years of service.

Ralph E. Sease, supervisor of bridges and buildings of the Savannah division of the Central of Georgia, at Savannah, Ga., has been promoted to terminal trainmaster, Atlanta terminals, with headquarters at Atlanta, Ga.

William C. Hurst, president of the Chicago & Illinois Midland, at Springfield, Ill., and an engineer by training and experience, has retired. Mr. Hurst entered railway service in 1890 as a water boy with the Chicago, Burlington & Quincy, serving subsequently as a track laborer, rodman, assistant engineer and resident engineer on construction. He entered the operating department of the Missouri Pacific in 1903, and in 1914, after serving several railroads in numerous capacities, he went with the Chicago, Peoria & St. Louis, of which the C. & I. M. was then a portion, as vice-president and general manager. In 1926, when the C. P. & St. L. was broken up and the C. & I. M. was formed, he went with the latter as senior vice-president, being elected president in June, 1940.

Richard Warren Grigg, division engineer of the Long Island Railroad, with headquarters at Jamaica, L.I., has been promoted to superintendent of the Delmarva division of the Pennsylvania, with headquarters at Cape Charles, Va. Mr. Grigg was born at Richmond, Va., on May 27, 1907, and was graduated in civil engineering from Virginia Polytechnic Institute in 1929. He entered railway service on June 16, 1929 as an assistant on the engineering corps of the Eastern division of the Pennsylvania at Pittsburgh, Pa., later being transferred successively to Uniontown and Sharon, Pa., and to Wooster, Ohio. On September 1, 1931, he was appointed inspector on electrification work, office of the chief engineer, Philadelphia, Pa., and on May 10, 1932, he was appointed assistant on the engineering corps at Derry, Pa. On July 10, 1933, Mr. Grigg was promoted to asistant supervisor of track at Wellsville, Ohio, and on April 1, 1934, he was transferred to Steubenville, Ohio. Two weeks later he was transferred to Derry, Pa., and on January 1, 1936, he was promoted to supervisor of track at Orrville, Ohio. On October 16, 1936, Mr. Grigg was transferred to special duty in the office of the chief engineer of the system at Philadelphia, and on September 1, 1937, he was transferred to Piqua, Ohio. On October 1, 1939, he was transferred to New Brunswick, N.J., and on January 1, 1942, he was advanced to asistant division engineer of the Ft. Wayne division, with headquarters at Ft. Wayne, Ind. Three months later he was promoted to division engineer of the St. Louis division, with headquarters at Terre Haute, Ind. Mr. Grigg was transferred to Cleveland, Ohio, in February, 1943, and to the Long Island Railroad in July, 1943.

Engineering

W. R. Talbott has been appointed assistant engineer on the Chesapeake & Ohio, at Richmond, Va.

F. D. Danford, office engineer of the Texas & Pacific, at Dallas, Tex., has been promoted to assistant to the chief engineer, with the same headquarters.

W. Brass, asistant resident engineer on the Canadian National, at Prince Rupert, B.C., has retired after forty years of railway service.

C. M. Kern has been appointed assistant cost engineer, Mountain and James River subdivisions of the Chesapeake & Ohio, at Clifton Forge, Va.

E. M. Killough, recently released from military service, has returned to his former position of valuation engineer of the Western Maryland, with headquarters at Baltimore, Md.

H. B. Barry, assistant chief engineer of the St. Louis-San Francisco, at Springfield, Mo., has been promoted to chief engineer with the same headquarters, succeeding **Frank G. Jonah,** whose death is reported elsewhere in this issue.

W. A. Spell, chief engineer of the Atlanta, Birmingham & Coast, at Atlanta, Ga., has been appointed engineer maintenance of way of the Western division of the Atlantic Coast Line, due to merger of the A. B. & C., into the Coast Line.

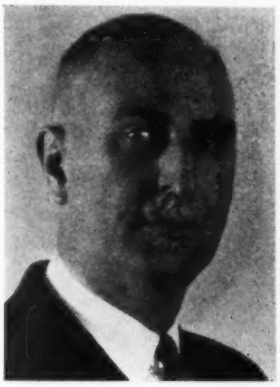
W. N. Cramer, assistant engineer of the Springfield division of the Illinois Central, has been promoted to assistant to the division engineer, with headquarters as before at Clinton, Ill., a new position. The position of assistant engineer at Clinton has been abolished.

E. W. Hobbs has been appointed engineering assistant, executive department, of the Missouri Pacific, with headquarters at St. Louis, Mo., succeeding **P. P. Wagner,** who has been appointed assistant chief engineer, with headquarters at St. Louis, which position has been vacant since May 22, 1945.

L. B. Hewlett, supervisor of track on the Chesapeake & Ohio, at Pikeville, Ky., has been promoted to assistant division engineer at Ashland, Ky., succeeding **F. C. Cunningham,** who has been transferred to Russell, Ky. Mr. Cunningham relieves **C. C. Madison,** whose promotion to assistant trainmaster is reported elsewhere in these columns.

J. M. R. Fairbairn, retired chief engineer of the Canadian Pacific, has been awarded the Sir John Kennedy Medal for 1945 by the Engineering Institute of Canada, "in recognition of outstanding merit in the engineering profession." The award commemorates the services rendered to the development of Canada, engineering science and the profession by the late Sir John Kennedy, a past president of the Engineering Institute of Canada.

Mr. Fairbairn served 21 years as chief engineer of the C.P.R., retiring in 1939. Two years later he became director of works and buildings for the Department of National Defense, Naval Affairs, at Ottawa, Ont., retiring from that position in 1942. During his career he has served as president and a member of the council of the Engineering Institute of Canada, also as a director of the American Railway Engineering Association, and as a member of the Institute of Engineers of Great Britain and the American Society of Civil Engineers.



J. M. R. Fairbairn

C. E. Gipe, assistant division engineer of the Ft. Wayne division of the Pennsylvania, at Ft. Wayne, Ind., has been promoted to division engineer of the Renovo division, at Erie, Pa., succeeding **J. W. Wallenius,** who has been appointed division engineer of the Long Island (a subsidiary of the Pennsylvania), with headquarters at Jamaica, N.Y. Mr. Wallenius replaces **R. W. Grigg,** whose promotion to superintendent of the Delmarva division of the Pennsylvania is reported elsewhere in this issue. **George Baylor,** a former track supervisor on the New York division, and now returning from military service, has been appointed assistant division engineer on the Ft. Wayne division, succeeding Mr. Gipe.

H. J. Seyton, assistant chief engineer of the Great Northern, at Seattle, Wash., has been promoted to chief engineer, with headquarters at St. Paul, Minn., succeeding **C. M. Nye,** who has retired after 36 years of service. **H. M. Goehring,** office engineer, at St. Paul, has been advanced to assistant chief engineer, at Seattle, replacing Mr. Seyton, and **M. A. McChesney,** chief draftsman, has been promoted to office engineer, with headquarters as before at St. Paul, replacing Mr. Goehr-

ing. **T. D. McMahon,** who has been the road's architect since 1914, has retired after 40 years of service, and **J. W. Hayes,** assistant architect, at St. Paul, has been advanced to architect, with the same headquarters, succeeding Mr. McMahon. **W. J. Cruse,** chief detector car operator, has been promoted to inspecting engineer, at St. Paul, replacing **O. E. Williams,** who has retired after 35 years of service. **R. R. Manion** has been appointed engineer maintenance of way, at St. Paul, a new position.

W. C. Gretzinger, whose promotion to assistant division engineer of the Philadelphia Terminal division of the Pennsylvania, with headquarters at Philadelphia, Pa., was reported in the October issue, was born at Lewisburg, Pa., on March 7, 1905, and was graduated in civil engineering from Bucknell University in 1927. On June 13, 1927, he entered railway service as an assistant on the engineer corps on the Williamsport division of the Pennsylvania, later being transferred successively to the Maryland and New York divisions. In July, 1928, Mr. Gretzinger was promoted to assistant supervisor of track at Jamesburg, N.J., later being transferred successively to New York, Trenton, N.J., and Philadelphia, and on February 1, 1934, he was advanced to supervisor of track at Media, Pa. Mr. Gretzinger later served in that capacity at Perryville, Md., Wilkes-Barre, Pa., Reading and Newport, being located at the latter point at the time of his recent promotion, which was effective September 15.

William P. Conklin, whose promotion to division engineer of the Toledo division of the Pennsylvania, was reported in the November issue, was born at Washington, Pa., on June 25, 1903, and received his higher education at Washington & Jefferson College. He first entered railway service on April 10, 1923, in the construction department of the Pennsylvania, working at various locations until August 30, 1925, when he resigned to complete his schooling. Upon completion of his education he entered the employ of the Koppers Construction Company, Pittsburgh, Pa., remaining with that concern until July, 1928, when he returned to the Pennsylvania as an assistant on the engineering corps of the Pittsburgh division. After working in various locations on the Central region and in the New York zone, Mr. Conklin was promoted to assistant supervisor of track at Canton, Ohio, in February, 1934, later that same year being transferred to Cresson, Pa. In April, 1935, he was advanced to supervisor of track at Monongahela, Pa., and two years later he was transferred to Terre Haute, Ind., where he remained until April, 1941, when he was sent to Chicago. In July, 1943, he was further advanced to assistant division engineer, at Columbus, Ohio, the position he held at the time of his recent promotion.

R. J. Middleton, whose promotion to chief engineer of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago, was reported in the December issue, was born near Greenwood, Ark., on September 29, 1881, and received his higher education at the University of Arkansas. He entered railroad service on February 2, 1906, as a draftsman in the bridge and building department of the Milwaukee in Chicago. From October, 1906, to October, 1908, he was assistant engineer on bridge and building work at Ottumwa, Iowa, and from the latter date to December, 1910, he served in the same capacity on the Evanston track elevation, at Evanston, Ill. During the years 1911 and 1912 he served as assistant engineer in charge of construction of yard and engine terminals at Bensenville, Ill., and Savanna. Subsequently, during 1913 to 1915, he was engineer of track elevation at Chicago. From 1916 to June, 1918, he

R. J. Middleton

was valuation engineer for the Milwaukee system at Chicago. On June 15, 1918, Mr. Middleton was promoted to assistant chief engineer, lines west of the Missouri river, with headquarters at Seattle, Wash., in which capacity he served until March 1, 1933, when another advancement made him asistant chief engineer of the system at Chicago, the position he held at the time of his recent promotion.

Robert B. Jones, engineer of track of the Canadian Pacific, has been promoted to the newly-created position of assistant chief engineer of the system, with headquarters as before at Montreal, Que., and **W. G. Dyer,** division engineer at Penticton, B.C., has been advanced to engineer of track of the system, with headquarters at Montreal, succeeding Mr. Jones.

Glenn A. Williams, whose promotion to engineer maintenance of way of the Eastern Ohio general division of the Pennsylvania, with headquarters at Pittsburgh, Pa., was reported in the November issue, was born on May 1, 1904, at Altoona, Pa., and was graduated from Penn State University in 1927. He entered railway service with the Pennsylvania on June 9, 1927, as assistant on the engineer corps, with headquarters at Middletown, Pa., and on July 8 of that year was transferred to Tyrone, Pa. On February 18, 1928, he was promoted to assistant supervisor of track, with headquarters at Phillipsburg, N.J., and later served in the same capacity at Camden, N.J., and Chester, Pa. In 1929 he was advanced to supervisor of track at Lock Haven, Pa., later serving in that capacity successively at Chambersburg, Pa., Camden, and on the Philadelphia Terminal division, and as supervisor, special duty, in the traffic department, at Philadelphia, Pa. Mr. Williams was promoted in 1939 to division engineer of the Conemaugh division, with headquarters at Pittsburgh, later being transferred to the Chicago Terminal division, and then to the Philadelphia division, where he was located until his recent promotion.

W. L. Young, bridge engineer of the Norfolk & Western, has been promoted to principal assistant engineer, with headquarters as before at Roanoke, Va., succeeding **F. P. Turner,** who retired from active service on December 1. **H. F. Smith,** assistant engineer, Eastern General division, has been advanced to bridge engineer, replacing Mr. Young, and **B. E. Crumpler,** maintenance engineer, has been promoted to assistant engineer, Eastern General division, relieving Mr. Smith. **John F. Newsom, Jr.,** resident engineer, has been advanced to maintenance engineer, succeeding Mr. Crumpler, and **J. H. Norwood,** a draftsman in the engineering department, has been promoted to resident engineer, replacing Mr. Newsom.

Track

W. J. H. Howatt, roadmaster on the Canadian National, at Charlottetown, P.E.I., since 1927, has retired from active service.

W. R. Pruitt, acting supervisor of track on the Illinois Central, at Princeton, Ky., has been advanced to supervisor at that point.

William F. Monahan, general track supervisor on the Southern Pacific, at San Francisco, Cal., has retired after more than 53 years of railroad service.

E. M. Thornley has been appointed acting supervisor of track on the Alton, at Joliet, Ill., instead of C. E. Thornley, as reported erroneously in the December issue.

A. Krausman, general track foreman on the Chicago, Great Western, at Oelwein, Iowa, has been promoted to roadmaster at Dubuque, Iowa, succeeding **R. C. McIntosh,** who has resigned.

N. E. Scribner, general roadmaster of the Erie, at Youngstown, Ohio, since 1929, who has been on leave of absence since April, 1945, because of illness, has retired.

Charles Weller, who has been on leave of absence to serve in the armed forces of the United States, has been appointed assistant supervisor of track on the St. Louis division of the Illinois Central, with headquarters at Carbondale, Ill.

J. P. Whalen, roadmaster on a system steel gang of the Chicago, Milwaukee, St. Paul & Pacific, has been promoted to roadmaster on the Iowa division, at Marion, Iowa, succeeding **G. Barnoske,** who has been assigned to other duties at his own request.

W. J. Mallon, assistant superintendent of maintenance of way of the Chicago, South Shore & South Bend, has been promoted to superintendent of maintenance of way, with headquarters as before at Michigan City, Ind., succeeding **W. A. Underwood,** who has retired.

H. A. Curtiss, formerly supervisor of track on the Grand Rapids division of the Pennsylvania, and who now returns from military service, has been appointed acting supervisor of track on the Ft. Wayne division, at Warsaw, Ind., succeeding **R. E. Miller,** who has been granted a leave of absence because of ill health.

I. D. Holmes, who has been on leave of absence to serve with the United States Railway Mission to Mexico, has been appointed supervisor of track on the Illinois Central, at Dyersburg, Tenn., succeeding **J. H. Dame,** who has been transferred to Durant, Miss. Mr. Dame relieves **G. H. Peacock,** who has retired after 48 years of service.

J. T. Deason, a section foreman on the Central of Georgia, has been promoted to track supervisor on the Columbus division, at Columbus, Ga., succeeding **J. B. McKerley,** whose promotion to supervisor of bridges and buildings is reported elsewhere in this issue. Mr. Deason entered the employ of the Central of Georgia in May, 1922, as a section laborer, subsequently serving as assistant section foreman and section foreman at various points.

V. W. Phillips, extra-gang foreman on the Scioto division of the Norfolk & Western, has been promoted to assistant roadmaster on the Pocahontas division at Bluefield, W. Va. **B. H. Tinsley,** section foreman of the Roanoke (Va.) terminal, has been advanced to assistant roadmaster on the Radford division. **H. R. Leftwich,** assistant roadmaster at Grundy, Va., has been transferred to Chillicothe, Ohio. **W. O. Tracy, Jr.** has been appointed assistant roadmaster at Portsmouth, Ohio.

Charles Arthur Godden, whose promotion to roadmaster on the Canadian National, with headquarters at Palmerston, Ont., was reported in the October issue, was born at Kent, England, on May 24, 1909, and attended St. Paul's school in Ontario. He entered railway service on May 17, 1928, as a sectionman on the Canadian National at Brampton, Ont., later working on various sections in and near Stratford, Ont. In 1941 Mr. Godden was promoted to assistant foreman in the Stratford yard, and a year later was advanced to foreman, which position he held until his recent promotion.

Allen L. Sams, whose promotion to supervisor of track on the Illinois Central, at Gilman, Ill., was reported in the November issue, was born at Brownsville, Ohio, on July 9, 1917, and was graduated in civil engineering from Purdue University in 1941. He entered railway service in June, 1941, as a chainman on the Illinois Central at Clinton, Ill., subsequently serving as rodman and assistant supervisor of track at that point, until October, 1943, when he was advanced to supervisor at Olney, Ill. From September, 1944, until June, 1945, he served as assistant trainmaster at Vicksburg, Miss., becoming asistant supervisor of track at Dyersburg during the latter month, and remaining in that position until his recent promotion.

Howard J. Preston, whose promotion to supervisor of track on the Pennsylvania, at Carrothers, Ohio, was reported in the November issue, was born at Greenville, Ill., on October 4, 1898, and was educated in the public schools of Troy, Ill. He entered railway service on September 22, 1922, as a trackman on the Pennsylvania at Troy, advancing to track foreman, at Highland, Ill., in April, 1926. In June, 1942, he was promoted to general foreman at Greenville, subsequently serving at Terre Haute, Ind. He was further advanced to assistant supervisor of track at Baltimore, Md., in January, 1944, remaining in that position until his recent promotion.

Bridge and Building

F. W. Madison, a member of an engineering party on the Chicago, Rock Island & Pacific, at Centerville, Ia., has been promoted to supervisor of bridges, at Des Moines, Ia., succeeding **Samuel P. Perkins,** who has retired after forty years of service.

Raymond De Jaiffe, who was formerly master carpenter of the Atlantic division of the Pennsylvania, and who is now returning from military service, has been appointed master carpenter of the Toledo division, at Toledo, Ohio, succeeding **R. E. Mull,** who returns to his former position as foreman carpenter, at Philadelphia, Pa.

J. B. McKerley, track supervisor on the Central of Georgia, at Columbus, Ga., has been promoted to supervisor of bridges and buildings of the Savannah division, at Savannah, Ga., succeeding **R. E. Sease,** whose promotion to terminal trainmaster, at Atlanta, Ga., is reported elsewhere in these columns. A brief sketch of Mr. McKerley's railway career appeared in the October, 1945, issue of *Railway Engineering and Maintenance.*

H. H. Kruse, a system scale inspector on the Chicago, Milwaukee, St. Paul & Pacific, has been promoted to chief carpenter on the Iowa and Dakota division, at Mitchell, S.D., with jurisdiction over the lines of that division, Mitchell and west, a new position. **A. M. Glander** remains chief carpenter on the Iowa and Dakota division, with headquarters at Mason City, Iowa, and retains supervision over those lines of the division east of Mitchell.

Water Service

J. M. Davis has been appointed supervisor of water service of the Springfield division of the Illinois Central, with headquarters at Clinton, Ill., a new position.

Obituary

Wesley T. Hargrett, vice-president and general manager of the Live Oak, Perry & Gulf, who served from 1889 to 1908 as a roadmaster on the Atlantic Coast Line, died at his home at Tifton, Ga., on October 14, 1945.

Edward J. Langford, former chief engineer of the New York, Westchester & Boston (now abandoned), died of a cerebral hemorrhage on December 19 at his home in Ralston, N.J.

Charles Leslie Marks, supervisor of bridges and buildings on the Chesapeake & Ohio, at Richmond, Va., died on November 17.

G. A. Haskins, engineer maintenance of way of the Akron, Canton & Youngstown, at Akron, Ohio, died in that city on October 22. Mr. Haskins was born on September 29, 1891, at North Adams, Mass., and began his railway career in 1919 as a chainman in the engineering department of the Boston & Maine. In 1927 he became resident engineer, and in 1929 he was further advanced to assistant engineer. In 1933 he was named assistant track and bridge and building supervisor at Brattleboro, Vt., and North Adams, Mass. Mr. Haskins went with the A. C. & Y. in 1937 as division engineer, and in February, 1944, he was promoted to engineer maintenance of way.

G. A. Haskins

Elbridge A. Johnson, who was formerly division engineer on the Maine Central, at Portland, Me., and whose death on September 27, was reported in the December issue, was born at Portland on November 4, 1880, and was graduated in civil engineering from the University of Maine in 1902. He entered railway service immediately after graduation, as a transitman, being promoted to assistant engineer in 1903 and to roadmaster in 1908. In 1912 Mr. Johnson was advanced to superintendent of bridges and buildings at Bangor, Me., later being transferred to Portland. In 1933 he was appointed roadmaster at Portland, and in 1938 he was promoted to division engineer, with the same headquarters, which position he held until 1943, when he was assigned to other duties.

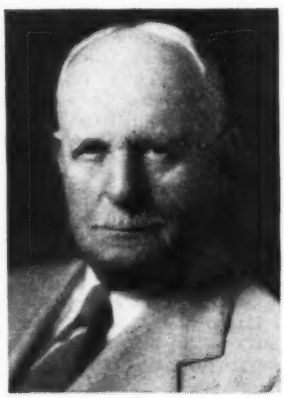
George K. Thornton, retired engineer of track of the Boston & Maine, whose death on November 18, was reported in the December issue, was born on January 22, 1865, at Thornton, N.H., and entered railway service in January, 1887, as a telegraph laborer on the Boston & Lowell (now part of the Boston & Maine), later serving successively as a timekeeper on construction, laborer on stock, maintenance of way storekeeper, and a section foreman. On July 15, 1897, he was promoted to roadmaster at

Woodsville, N.H., later being transferred to Salem, Mass. Mr. Thornton was advanced to division engineer at Salem on November 1, 1911, and on September 1, 1925, was appointed acting engineer maintenance of way at Boston. On February 1, 1926, he was appointed assistant to the engineer maintenance of way at Boston, and two years later was promoted to engineer of track, with the same headquarters.

F. L. C. Bond, who retired in 1944 as vice-president and general manager of the Central region of the Canadian National, and who was a past president of the American Railway Engineering Association, died at Montreal, Que., on December 9. Mr. Bond was born at Montreal on February 21, 1877, and was graduated from McGill University, Montreal, in 1898. He entered the service of the Grand Trunk Western in 1898 as assistant to the resident engineer, Eastern division, and in 1901 he was appointed engineer in charge of double-track construction. From January to March, 1902, he was night superintendent on construction of the New York City subway system, returning to the Grand Trunk in April of that year. He was then appointed resident engineer, Eastern division, in which position he remained until 1913, when he became a division engineer on the Eastern lines. After service in France during World War I as a major of the 10th Battalion of Canadian railway troops, Mr. Bond returned to the Grand Trunk as chief engineer, and following amalgamation of the lines comprising the Canadian National, he was appointed regional chief engineer, Central region, with headquarters at Toronto. He held this position until April, 1924, when he was appointed general superintendent of the Montreal district. In 1936 he was promoted to general manager of the Central region, and in 1939 he was elected vice-president in addition to his duties as general manager of the Central region. Mr. Bond was long active in the A.R.E.A., and in 1941 he served as president of that organization.

F. L. C. Bond

Frank Gilbert Jonah, chief engineer of the St. Louis-San Francisco, at St. Louis, Mo., died in the Frisco hospital in that city on December 7. Mr. Jonah was born in Albert County, New Brunswick, Canada, on October 6, 1864, and entered railway service in May, 1882, as a student in the chief engineer's office of the Intercolonial (now part of the Canadian National), subsequently serving as assistant engineer on new line construction in Nova Scotia. In April, 1890, he came to St. Louis as assistant engineer on the St. Louis Merchants Bridge Terminal (now part of the Terminal Railroad Association of St. Louis), serving in that capacity for four years, when he went with the St. Louis, Peoria & Northern (now part of the Illinois Central) as resident engineer. In December, 1899, he became engineer maintenance of way of the Chicago & Alton (now Alton) and in May, 1901, Mr. Jonah was appointed chief engineer of the Blackwell, Enid & Southwestern (now part of the Frisco). His subsequent career, except for military service during World War I, was entirely with the Frisco and its subsidiaries, although certain of these lines have subsequently become parts of the Missouri Pacific and Southern systems. He served briefly in 1903 as assistant engineer of the New Orleans Terminal Company (now a subsidiary of the Southern), and then became chief engineer of the St. Louis, Brownsville & Mexico (now an M. P. subsidiary). From October, 1904, to May, 1905, he was locating engineer of the Frisco, returning to the New Orleans Terminal in the latter month as terminal engineer. He was appointed chief engineer of construction of the Frisco in 1910, and chief engineer in March, 1913, holding the latter position until his death. During World War I he served in France, first as a major in the U. S. 12th Engineers, and later as a lieutenant colonel, being chief engineer, department of light railways.



Frank Gilbert Jonah

Air Tool Accessories—The Construction Equipment Division of Worthington Pump & Machinery Corp., Holyoke, Mass., has published a new 12-page bulletin describing the accessories manufactured by this company for rock drills and air tools. Included are illustrations, specifications and price lists on pavement breaker tools, clay and trench digger tools, air line lubricators, air hose, air and water hose fittings, columns for drifting drills, universal column arms, air-line manifolds, tripods, detachable bits and bit rods, and water tank assemblies and accessories.

Association News

Track Supply Association

The association, under the immediate direction of Harry C. Hickey, president, and Lewis Thomas, secretary, has contracted for space with the Hotel Stevens, Chicago, looking to a large exhibit of the products of its member companies, in conjunction with the concurrent meetings of the Roadmasters' Association and the American Railway Bridge and Building Association, in Chicago on September 17-19. Furthermore, because of the interest of bridge and building officers in the activities of the convention week, the association is also inviting members of the Bridge and Building Supply Men's Association to join in its exhibit.

Roadmaster's Association

On the call of H. E. Kirby, president, the Executive committee of the association met in Chicago on December 7, giving over most of the day to the selection of the personnel of technical committees for the ensuing year. As soon as the chairmen and vice-chairmen have been notified of their appointments and have agreed to serve, a complete list of the personnel of committees will be printed in these columns.

Consideration at the meeting was also given to preliminary plans for the annual meeting of the association, to be held in Chicago on September 17-19—concurrent with, but independent of, the annual meeting of the American Railway Bridge and Building Association.

Bridge & Building Association

The Executive Committee of the association met in Chicago on December 17, and, after disposing of many routine matters, including consideration of preliminary plans for its annual meeting to be held in Chicago on September 17-19, gave over the remainder of a long day to the selection of the personnel of the various committees to prepare reports during the year. It is expected that a full list of the members making up these committees, including chairmen and vice-chairmen, can be reported in the February issue.

About the middle of December all members of the association were furnished a complete printed report of the proceedings at the one-day annual meeting of the association held in Chicago, October 17.

Metropolitan Maintenance of Way Club

The Metropolitan Maintenance of Way Club will hold a dinner meeting in the Skyline room of the Hotel Sheraton, New York City, on Thursday, February 28. At the December 6 luncheon meeting of the club, 110 members and guests were present to hear J. B. Akers, assistant chief engineer, Southern, present an address on "The Part Engineering Research Must Play in Future Railroad Progress, Relating Principally to Maintenance of Way and Structures." Mr. Akers reviewed

(Continued on page 86)

many of the developments in methods and materials that had been brought about by research and pointed out that many problems remain to be solved. He appealed for more reports on their problems from practical maintenance men in the field, based on careful observation, to aid maintenance officers in ascertaining the results of service tests and in determining how future research can be oriented toward solving those problems.

Maintenance of Way Club of Chicago

The first meeting of the club in the new year will be held in the Ambassador Room of Huyler's Restaurant, Chicago, on January 28. Following the usual dinner at 6:30 p.m., the meeting will be addressed by L. W. Horning, vice-president, personnel, New York Central System, who will speak on The Supervisor's Responsibility in Public Relations. As directing head of an outstandingly successful public relations program being conducted among employees on the New York Central, and as chairman of the Subcommittee on Labor and Personnel of the Railroad Committee for the Study of Transportation, A.A.R., Mr. Horning will have a message of interest and timely importance to members.

The last meeting of the club, with an attendance of 124 members and guests, was held on Monday evening, December 17, with a three-part program dealing with the subject, What Are You Going to Do About It? This program was a sequel to that at the November meeting, when C. H. Mottier, vice-president and chief engineer of the Illinois Central System, spoke on, What Is Ahead of Us? The December meeting, which gave special consideration to three of the most important phases of roadway and structures maintenance—track, bridges and buildings, and work equipment—was addressed by A. G. Reese, district engineer maintenance of way, Chicago, Burlington & Quincy; A. E. Bechtelheimer, bridge engineer, Chicago & North Western; and C. E. Morgan, superintendent of work equipment and welding, Chicago, Milwaukee, St. Paul & Pacific.

American Railway Engineering Association

With the work of the standing committees for the year drawing to a close, there were no committee meetings held in December and only one is scheduled to be held in January, this being a meeting of the Committee on Economics of Railway Location and Operation at Cincinnati, Ohio, on January 23.

The report of the Nominating committee was received at a recent meeting of the Board of Directors. As a result of the action of the committee, the following names will appear on the ballot to be mailed shortly to members:

President, J. B. Akers, assistant chief engineer, Southern Railway System, Washington, D. C.; vice-president, Armstrong Chinn, chief executive officer, Alton, Chicago; directors (three to be elected), C. H. Blackman, chief engineer, Louisville & Nashville, Louisville, Ky.; W. J. Hedley, assistant chief engineer, Wabash, St. Louis, Mo.; J. S. McBride, chief engineer, Chicago & Eastern Illinois, Chicago; J. M. Symes, vice-president, Pennsylvania, Western region, Chicago; J. F. Pringle, vice-president and general manager, Canadian National, Toronto, Ont.; E. C. Vandenburgh, engineer of maintenance, Chicago & North Western, Chicago; E. E. Oviatt, chief engineer, New York, New Haven & Hartford, New Haven, Conn.; S. E. Armstrong, engineer maintenance of way system, New York Central, New York, and H. F. King, special engineer, Erie, Cleveland, Ohio.

For members of the Nominating committee (five to be elected): R. P. Hart, chief engineer, Missouri Pacific, St. Louis, Mo.; O. G. Wilbur, assistant to engineer of buildings, Baltimore & Ohio; T. A. Blair, assistant chief engineer, system, Atchison, Topeka & Santa Fe, Chicago; C. B. Bryant, assistant to vice-president in charge of research and tests, Southern Railway System, Washington, D.C.; L. T. Nuckols, engineer maintenance of way, Chesapeake & Ohio, Richmond, Va.; L. L. Adams, assistant chief engineer, Louisville & Nashville, Louisville, Ky.; F. J. Bishop, engineer maintenance of way, Toledo Terminal, Toledo, Ohio; C. H. Fox, special engineer, Canadian Pacific, Winnipeg, Man.; W. H. Brameld, assistant to chief engineer maintenance of way, Erie, Cleveland, Ohio, and W. D. Simpson, chief engineer, Seaboard Air Line, Norfolk, Va.

In addition to the above names to be balloted on C. J. Geyer, general manager, Chesapeake & Ohio, will be advanced automatically to the position of senior vice-president.

Late in December, Bulletin No. 456 was mailed to members, and in January they will receive Bulletin No. 457, which will contain reports of the Committees on Wood Bridges and Trestles, Masonry, Records and Accounts, Iron and Steel Structures, Waterproofing, Impact and Bridge Stresses, and Co-operative Relations with Universities. This bulletin will also contain a reprint of the report on electrolysis of concrete that has been prepared by a committee of the Electrical Section, A.A.R.

R. G. LeTourneau, Inc.—An attractive 24-page catalog has been published by R. G. LeTourneau, Inc., Peoria, Ill., which contains the latest information on LeTourneau, earthmoving and lifting equipment. The book is well illustrated, describes the operational features of each tool and unit of equipment, includes their specifications, and tells of the improvements over previous models.

Today It's Track and Rubber—The Caterpillar Tractor Company, Peoria, Ill., has published an attractive well-illustrated 12-page booklet with the foregoing title, which describes its lines of track-type and wheel-type tractors; divides the problem of earthmoving into three zones; and tells how the two types of tractors meet the requirements of these three zones. The booklet also tells how each type of equipment can be best adapted to the varied problems involved in earthmoving.

Supply Trade News

General

The **Pittsburgh Plate Glass Company** has announced the construction of a new $1,750,000 plant at Springdale, Pa., in which a complete line of paints, varnishes, enamels and synthetic resins will be manufactured.

A new plant at Plymouth, Mich., nearly three times as large as its present Detroit plant, has been acquired by the **Evans Products Company.** Transfer of all operations to the new factory will be made this winter, including the manufacture of the Evans Auto-railer, a combination rail-highway vehicle.

The **Air Reduction Sales Company,** New York, has begun the construction of a new mechanical research laboratory at New Providence, N.J. The new two-story building will have a floor area of 78,000 sq. ft. and will house the company's research activities in the development of processes and apparatus for using industrial gasses and the electric arc in cutting, welding and the treating of metals.

The **International Harvester Company** has purchased from the Defense Plant Corporation the former Buick plant at Melrose Park, Ill., for expanded production of its industrial power line of products. Engines to be manufactured in the new factory are the entire line of Diesel motors from 35 to 200-hp.; a 65-hp. gasoline engine; a large new model crawler tractor, to be known as the TD-24; and a full line of stationary power units.

Personal

John G. Barta has been appointed manager of the Duluth, Minn., sales office of **Allis-Chalmers,** succeeding William H. Knight, who has resigned.

Clerence M. Allen, assistant branch manager of the Cleveland, Ohio, office of the **Philip Carey Manufacturing Company,** has been appointed branch manager at St. Louis, Mo.

Daniel L. O'Brien has been appointed a distributor of the **Worthington Pump & Machinery Corp's.** line of Blue Brute concrete mixers. Mr. O'Brien will maintain offices at 326 Endicott building, St. Paul, Minn.

Joseph B. Terbell, who has been affiliated with various divisions of the **American Brake Shoe Company** since 1928, has been appointed executive vice-president of the **American Manganese Steel** division of the company.

J. B. Akers, Jr., who for the last three years has been southeastern representative of the Buda Company, has been appointed sales and service engineer of the **Ralph W. Payne** organization, with headquarters at Washington, D. C.

(Continued on page 88)

Floyd S. Adams has been appointed to the sales staff of the **Worthington Pump & Machinery Corp.**, and has been assigned to the territory comprising Texas and Oklahoma. Mr. Adams will maintain his headquarters at Dallas, Tex.

A. C. Nydegger, who for the last two years has served in the United States Navy as an engineering officer, with the rank of lieutenant senior grade, has been appointed manager of the Milwaukee, Wis., office of the **Blackmer Pump Company.**

Eugene G. Grace, president of the **Bethlehem Steel Corporation,** has been elected chairman of the board of directors, and **Arthur B. Homer,** vice-president in charge of shipbuilding, has been elected president. In his new capacity, Mr. Grace will continue as the corporation's chief executive officer.

T. W. Gramm, formerly manager of the Philadelphia, Pa., office of the **Homelite Corporation,** Port Chester, N. Y., and who served that company as a technician with the Army and Navy during the recent war, has been appointed manager of the newly opened Chicago service office of Homelite. Mr. Gramm will maintain his office at 2409 Lake St., Melrose Park, Ill.

John A. English, Jr., assistant manager of railroad material sales of the **Carnegie-Illinois Steel Corporation,** at Chicago, has been promoted to assistant manager of Detroit district sales, with headquarters at Detroit, Mich. **Edward H. Backes,** who has been engaged in sales engineering in the railroad material and commercial forging division at Chicago, has been advanced to assistant manager of railroad material sales, with the same headquarters, succeeding Mr. English.

James B. Wright, a sales representative of the **Morrison Railway Supply Corporation** and **Morrison Metalweld Process, Inc.,** has been promoted to sales engineer of eastern railway sales of these companies, with headquarters at 30 Church St., New York. Mr. Wright, who is an engineering graduate of Drexel College, gained his first business experience in the office of the bridge engineer of the Reading, where he remained from 1928 until 1937. In the latter year he became an assistant supervisor of track for that road, serving in that capacity until 1939. He joined the Morrison organization in 1944 as a sales representative.

C. B. Smythe, vice-president of the **Thew Shovel Company,** Lorain, Ohio, has been elected president of the company, succeeding **F. A. Smythe,** who died on November 8, after serving 46 years in that capacity.

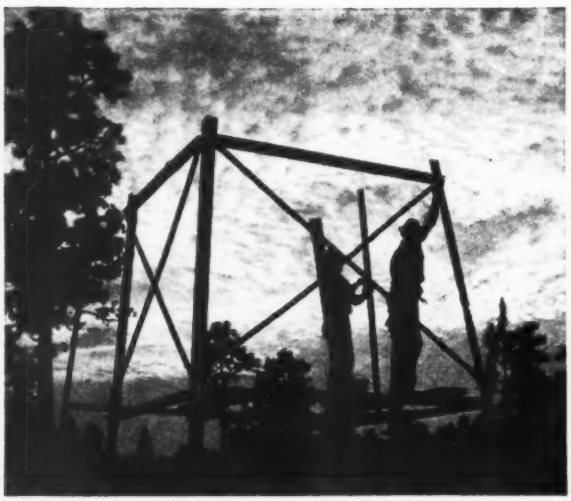
Harry E. Cotton, formerly city engineer of Omaha, Neb., has been appointed consulting engineer of the **American Rolling Mill Company,** with headquarters at Middletown, Ohio.

L. S. Marsh, metallurgical consultant, and **J. de N. Macomb,** manager of sales engineering, Railroad division, of **The Inland Steel Company,** Chicago, have retired. Mr. Macomb was born at Branchport, N. Y., on January 24, 1877, and was graduated from the University of Kansas in 1898 with the degrees of Bachelor of Science and Master of Science, and in 1901 he was awarded the degree of Civil Engineer. He entered railway service in 1899 on the Atchison, Topeka & Santa Fe and was engaged in surveys and construction projects for that road in Oklahoma, Texas and New Mexico as instrumentman, resident engineer and bridge engineer. In 1907 he became assistant engineer in the office of the chief engineer, serving in that capacity until 1911, when he was promoted to office engineer. In 1927 he went with the Inland Steel Company as assistant to the vice-president, later becoming manager of sales engineering, Railroad division, the position he was holding at the time of his retirement. Mr. Macomb was a delegate to the International Railway Congress, Bern, Switzerland, in 1910. During World War I he served from 1917 to 1919 as captain and major, Engineers, U. S. Army, and was in charge of track construction, general intermediate storage depot, Gievres, France. He is a member of the American Society of Civil Engineers and the American Railway Engineering Association, the latter of which he has served as a member of the Committee on Track since 1920, and was a member of the board of direction in 1927. Since 1930 he has been chairman of the A.R.E.A. Sub-committee on Design of Tie Plates.

Obituary

E. W. LaPlant, who retired in 1944 as a director of LaPlant-Choate Manufacturing Company, Cedar Rapids, Iowa, and who was one of the co-founders of that organization, died at the age of 73, in Cedar Rapids, on December 4.

E. C. Argust, vice-president and secretary of the Morden Frog & Crossing Works, Chicago, died in a hospital in that city on December 19. Mr. Argust was born in St. Louis, Mo., on June 29, 1883. He entered the employ of the Elliott Frog & Switch Works and when that firm was merged with Ramapo Ajax, in 1903, he went with the St. Louis Frog & Switch Co., remaining with the latter concern until it was dissolved in 1932. On January 1, 1933, he became associated with the Morden Frog & Crossing Works as vice-president in charge of sales.



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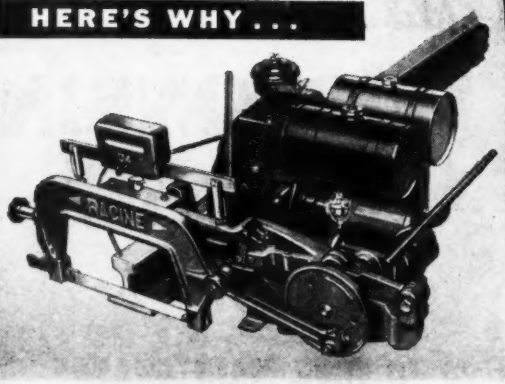

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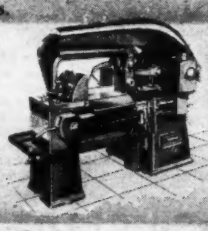

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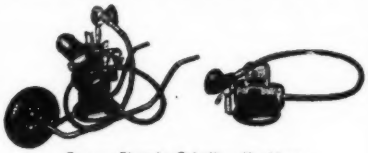

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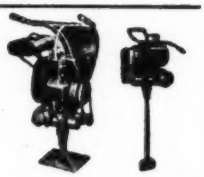

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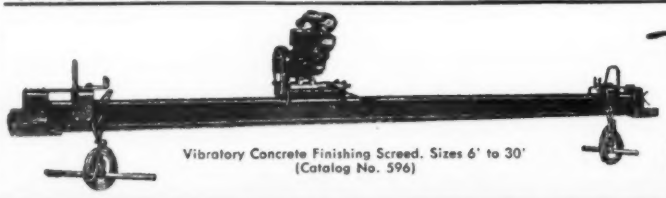

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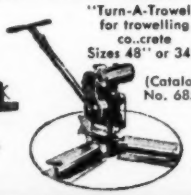

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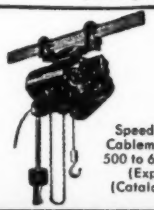

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ensions and holding all bolts tight.

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